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PRINCIPAL CONTENTS

PAGE

Investment Casting in the US and UK: Part II

The second review of conditions in the investment-founding industry, consisting of papers presented by Mr. R. F. Waindle and Mr. R. Taylor to the European Investment Casters' Association. Mr. Waindle deals with activities of the industry in America, together with current developments in high-strength and high-temperature alloys and alloy-steels. In Mr. Taylor's paper an account is given of the development and use of a stainless steel, FV.520 409

Foremanship Training in the British Foundry Industry

By F. C. Hayes

Description of the facilities available in this country for the education and training of foundry administrative personnel 419

What's the German Foreman Like?

By R. M. Lockwood Marsh 421

Moulage à la Cire perdue aux Etats-Unis et en Grande-Bretagne: deuxième partie. Seconde révision des conditions de l'industrie du moulage à la cire perdue, consistant en articles présentés par Mr. R. F. Waindle et Mr. R. Taylor à l'Association Européenne des Mouleurs à la Cire perdue. Mr. Waindle traite des activités de cette industrie en Amérique, ainsi que du développement actuel des alliages résistants à la traction et la chaleur, et des aciers fortement alliés. Dans l'article de Mr. Taylor un compte-rendu est donné du développement et de l'usage d'un acier inoxydable, F.V.520. 409

Entrainement des Contremaîtres dans l'Industrie Britannique de la Fonderie. Description des moyens mis en oeuvre dans ce pays pour l'éducation ét l'entrainement du personnel administratif de la fonderie. 419

Comment apparait le contremaître allemand ? Par R. M. Lockwood Marsh. 421

Genauguss in Amerika und England: Teil II. Diese zweite Übersicht über die Lage der Genaugussindustrie besteht aus den Vorträgen, die von R. F. Waindle und R. Taylor auf der Tagung des Europäischen Genaugussverbandes gehalten wurden. Waindle bespricht den Tätigkeitsbereich dieser Industrie in Amerika, im Zusammenhang mit der gegenwärtigen Entwicklung hochfester und hitzebeständiger Legierungen sowie legierter Stähle. Taylor gibt in seinem Vortrag einen Bericht über die Entwicklung und die Verwendung eines rostfreien Stahls, F.V.520. 409

Meisterausbildung in der englischen Giessereiindustrie. Eine Beschreibung der in England zur Verfügung stehenden Einrichtungen zur Erziehung und Ausbildung von Giessereiverwaltungspersonal. 419

Der deutsche Werkmeister, was er ist und wie er ist. Von R. M. Lockwood Marsh. 421

Features, News, Commercial Information and Statistics

Leader: Ladder to Management 407
Forty Years Ago 408
BCURA Twenty-first Anniversary 408
Forthcoming Events 408
Patterns in Plastic 418
Mechanical Handling Federation 418
Aluminium Oversupply for Next Few Years 418
Steelworks in Backgarden 418
BICTA'S First Annual Conference 423
Notes from the Branches 423
Law Cases 424
Company News 426
News in Brief 427
Engineering and Marine, Welding Exhibition 430
Personal 432
Raw Material Markets 434
Current Prices of Iron, Steel and Non-ferrous Metals 436

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FOUNDRY
TRADE JOURNAL

Vol. 106 APRIL 9, 1959 No. 2217

Ladder to Management

Elsewhere in this issue are printed two articles on complementary subjects. The first is a report on foremanship training in the UK, submitted to the European Committee of Foundry Employers' Organizations by Mr. F. C. Hayes, the training officer of the Council of Ironfoundry Associations. The second, reprinted with permission from *Foreman*—a publication issued by the Industrial Welfare Society—is an article on "What's the German Foreman Like?" by Mr. R. M. Lockwood Marsh. The opening paragraph of the report defines the job. This is just as well for under varying circumstances it is carried out by a chargehand, a manager, a master inspector, a supervisor and even a director as well as a foreman. Moreover, in this country a foreman in the arsenals, dockyards, and railway shops is, or used to be, really the manager.

The main difference between the continental and British and American systems is that, on the Continent, the foundry foreman having achieved that position can make no further headway. In this country's industrial history, a very large number of cases are recorded of men graduating from the shop floor to become leaders of industry. The restrictive nature of the handicaps imposed on the continental foreman are quite often made clear by the particularly high calibre of men occupying these posts. One foreman in a very large French works would, in our estimation, very quickly have been promoted in this country to departmental manager and would not have stopped there. Whilst most countries on the Continent have not gone so far as France with specialized courses of training, it must not be forgotten that the foundry foremen have their own organization for a mixture of mutual benefit and technology. In continental towns where there is a large number of small works, this rule of no promotion beyond the position of foreman is relaxed and access to higher positions is available. Moreover, a few decades ago, especially in Belgium, an ex-moulder could, and often did, set up in business for himself much as the patternmakers do to-day in this country.

There is a tendency in this country—not yet a movement—to follow the continental system of reserving managerial positions for graduates. But having seen the two systems close at hand, we prefer the British. Moreover, some of the very large firms must agree with this possibility of promotion from the bottom to the top as their schemes specifically include training for the very brightest lads with this objective in view. The educational facilities of this country are more than adequate to remedy the deficiencies in the early training of a youth, providing he is prepared to study hard in his spare time, the rewards being potentially greater here than on the Continent.

Forty Years Ago

The leading article in the April, 1919, issue of the JOURNAL still makes interesting reading as, at that time, the Government Departments issued specifications for cast iron without any reference to the—then admittedly unorganized—foundry industry. In his personal comment, the Editor objected to the "marrying" of chemical composition and mechanical strength in these specifications. It was also reported in this issue that, in 1918, no less than 18,780 tons of iron castings were made direct from blast-furnace metal. In an historical note emanating from a German source, the claim was made that Prince Rupert, of the Royal Society, was the inventor of malleable iron. The actual paragraph reads: "Réaumur, the well-known French savant, is generally credited with the invention of the process of making malleable castings, which he described in a book published in Paris in 1722. A writer in a recent issue of *Stahl und Eisen*, however, states that Réaumur was anticipated by Prince Rupert of the Royal Society, of London, basing his claim on a statement, printed in Dr. Joh. Joachim Becher's German book, entitled "Foolish Wisdom and Wise Folly," published at Frankfurt in 1682, according to which the Prince had invented a process by which iron could be made soft and ductile, so that it could be turned and used for making cannons of iron, which is not brittle but quite ductile, and, consequently, they are more suitable than those of ordinary gun-metal, their only drawback being that they were liable to rust. The writer quotes three patent specifications taken out in London by this Prince, dated between December 1, 1670, and the same day in 1671, relating to his process of softening cast or melted iron so that it may be filed and wrought as forged iron is. According to Becher, the Prince was carrying on his process in England on a large scale."

The report in the same JOURNAL of a meeting held in Coventry disclosed that the foundries of that city were working on excellent lines, and it appears that, 40 years ago, they must have led the country in technical progress. Another report is of a talk given in Sheffield by Mr. H. A. Greaves, of the Greaves-Etchell furnace concern. He spoke of the possibility of using the electric furnace for melting non-ferrous metals, a development then in its infancy. Also announced in this issue was a merger between John Wright and Eagle Range, Limited, the Richmond Gas Stove & Meter Company, Limited, and the Davis Gas Stove Company, Limited. (The actual registration of the new company—Radiation, Limited—came in the June, 1919, issue of the JOURNAL.) A foundry concern which appeared under "New Companies" was the Bridge Foundry Company, Limited, of Wednesbury.

BCURA Twenty-first Anniversary

On April 22, the British Coal Utilization Research Association celebrates the twenty-first anniversary of its foundation. To mark the occasion the Association is throwing its laboratories open to inspection for three days, from April 22-24 inclusive. The proceedings will be opened by the Rt. Hon. Lord Mills, K.B.E., Minister of Power.

The first day will be a private members' day, and visits by members of staff of government departments, research associations, universities and other interested bodies are arranged for April 23 and 24; parties from technical colleges and schools in the locality are also expected on those days. On the afternoon of April 24 the London section of the Royal Institute of Chemistry will be visiting the research station as part of its tour of the research organizations in the Leatherhead area.

Current researches to be displayed include a novel automatic chain-grate stoker designed for use for central-heating installations in large buildings, also equipment developed by BCURA for sampling and measuring dust and grit emission from industrial chimneys. An exhibition to be arranged on the premises by the Coal Utilisation Council will show how, over twenty-one years, the Association has pioneered the development of new forms of domestic heating.

A limited number of applications to visit the laboratories on the open days may still be considered, and those interested to attend should apply to the assistant to the director-general, BCURA, Randalls Road, Leatherhead, Surrey.

Forthcoming Events

APRIL 14

Institution of Mechanical Engineers

London branch:—"Finance and the Engineer," by Lord Chandos, 6.30 p.m., at the Institution of Civil Engineers, Great George Street, Westminster, S.W.1. (Annual joint meeting with the London graduates' sections of the Institutions of Civil and Electrical Engineers.)

Society of Chemical Industry

Corrosion group:—Spring lecture, "Studies of the Influence of Chemical Factors on the Corrosion of Metals," by Professor W. Feitknecht, 6.30 p.m., at 14, Belgrave Square, London, S.W.1.

Institute of British Foundrymen

East Anglian section:—Annual general meeting, at 7.15 p.m., followed by "Modern Foundry Practice," by V. W. Child, in the Lecture Hall, Public Library, Ipswich.

Coventry and district section:—Annual general meeting, followed by technical film show, 7.30 p.m., at the Coventry Technical College, Room A.5.

APRIL 15

Institution of Mechanical Engineers

Eastern graduate section:—Afternoon visit to the engineering laboratories of Cambridge University.

Institution of Production Engineers

Peterborough section:—"Modern Machine-tool Development at Home and Abroad," by N. Stubbs, 7.30 p.m., in the Conference Room, Peterscourt, Peterborough.

Combustion Engineering Association

Northern region:—"Furnaces as a Source of Fuel Economy," by A. L. Hancox, at 11 a.m., and at 2.30 p.m., "Economics of Thermal Insulation," by J. C. Stainton. Meeting to be held at the Royal Station Hotel, Newcastle.

Institute of British Foundrymen

North-east Lancs section:—Annual general meeting followed by a "Brains Trust," 7.30 p.m., at the Accrington College of Further Education, Sandy Lane, Accrington.

APRIL 16

Institution of Mechanical Engineers

East Midlands branch:—Annual meeting followed by "Modern Industrial Space Heating," by M. A. Colls, 7.15 p.m., in Room C4, Engineering Building, Nottingham University.

APRIL 18

Institute of British Foundrymen

Newcastle branch:—Annual general meeting and foundry film, 6 p.m., at the Neville Hall, Westgate Road.

A SURVEY of the need for improved operator-training techniques will be presented by Mr. W. Douglas Seymour of the Department of Engineering Production, Birmingham University, at a two-day course for works managers organized by the Industrial Welfare Society. The course which is to be held at the Hotel Rembrandt, Thurloe Place, London, S.W.7, on April 29 and 30, will finish with an open forum on personnel practice. The fee for the course is £6 6s. for delegates from member firms and £7 7s. from non-members.

Investment Casting in the US and UK—Part II

Continuing the review of papers presented at the European Investment Casters' Congress in Paris last year, this article consists of papers by R. Taylor and R. F. Waindle. Mr. Taylor deals with the development of a corrosion-resisting steel, and Mr. Waindle describes current developments in high-strength steels in America.

Metal Specifications and Practices in the US

*By Roger F. Waindle**

This paper is intended to describe the activities of the American investment-casting industry and to bring readers up to date on the current developments in high-strength and high-temperature alloys and alloy steels in America.

Statistics

Table 1 shows the types of metals cast, comparing 1954 to 1957, in the American investment-casting industry. It will be noted the trend is towards more steel and less non-ferrous (Cu- and Al-base). The high-temperature-alloy totals will be less for 1958, due to a decrease in the demand for gas turbines for military manned-aircraft, but the trend towards more stainless-steel castings appears to be as strong now as in 1957.

TABLE 1.—*Comparison of the* 1954 *and* 1957 *Production of Investment Castings in the Various Alloys.* (*The figures indicate percentage of total annual production.*)

	Stainless steel.	High-temperature alloys.	Iron-base alloys.	Copper-base alloys.	Aluminium-base alloys.
1954	25.0	13.5	19.5	20.5	21.5
1957	38.3	25.9	20.5	8.9	6.4

Casting production by weight shows, of course, that investment castings are predominantly small. Actually, 78 per cent. of the total number of castings weigh less than one lb. The trend, however, is towards heavier investment castings. Sales distribution in America in 1957 is shown in Table 2. To-day aircraft account for less sales than formerly but there is a strong trend towards more cast structural parts for aircraft and missiles.

TABLE 2.—*Sales of Investment Castings in* 1957 (*per cent.*).

Aircraft .. 66.3	Government 13.3	Commercial 20.4

Actual tonnage of metal melted as reported in 1957 is shown in Table 3; net deliveries can be estimated at about 40 per cent. of these figures. 1958 totals are estimated to be about 20 per cent. less.

TABLE 3.—*Types and Totals of Alloys Cast in* 1957.

Type.	Estimated annual tons melted.*
Stainless steel	1,906
High-temperature alloys	1,291
Iron base	1,019
Copper base	442
Aluminium base	320
Total	4,978

* Based on 30 companies submitting information on the types of metal cast.

Specifications

After spending considerable time on US specifications for investment castings, the Author has come to the conclusion that, in America, they attempt to spell out too much which, obviously, increases costs. Referring to the British specifications he has seen, he states that they are simpler and have less detail. Greater reliance appears to be placed on the integrity of the suppliers than is the case in the USA. American specifications show many requirements (such as tensile bars, reports, marking, etc.) which are not always needed by the consumer but are written into the specification, and since few engineers have the fortitude to waive specification requirements, again costs are added to without improvement to the product. This is done by a phrase "unless otherwise specified." An attempt has been made to correct this undesirable condition in the American Investment Casting Institute specifications by using the phrase "when specified" for much of the reporting requirements, reasoning that then the purchaser will specify which, if any, of the reports he actually needs. While the Investment Casting Institute conceived this approach separately, it is noted that the latest British specifications are also worded, and wisely so in the Author's opinion.

The justification for this was well demonstrated at a recent meeting wherein new permissives for the manner in which tensile test-bars are to be made for investment castings were introduced. Whilst the specifications in question made it mandatory that the foundry go to the expense of furnishing test-bars, user after user came to his feet to state they did not use such test-bars for casting evaluation, but rather cut test-pieces from the castings themselves. Obviously, then, the mass requirement for test-bars in the USA has become an economic waste. In America, the Investment Casting Institute is attempting, and successfully so,

* Mr. Waindle is president of WaiMet Alloys Company, division of Consolidated Foundries and Manufacturing Corporation, Michigan, and chairman of the metals division, Investment Casting Institute (USA).

to officially bridge the gap between foundry and user, with no thought of reducing quality of product, but with the plan to improve the economics of investment casting and thus increase market potential.

It is interesting to note that the ICI has been welcomed to every specification body in the US. This means that they have been instrumental in guiding the thinking of these official bodies, often before the specification is written. This will result in much greater usage of investment castings as time goes on.

Current Usage and Trends

In discussing the development and use of alloys, the high-temperature alloys will be discussed first, followed by the intermediate-range materials and finally, what the Author calls " room-temperature " alloys—these latter will also include the latest thinking in the USA on high tensile properties, ranging close to 134 tons per sq. in.

High-temperature Alloys

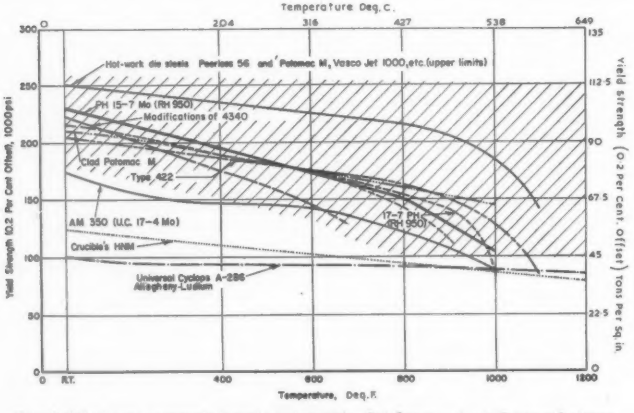
In general, it might be said that the US is still using pre-world-war II alloys as the best production-casting alloys available. Outstanding here are the older Stellite types, such as 31 and 21—composition and performances are well known. Newer alloys are, of course, on the horizon and many are already in partial usage.

Super-alloy castings, so-called because they are superior in high-temperature mechanical properties —creep strength, corrosion-resistance, ductility— are used in American gas-turbines as rotating, as well as stationary, members. The Author states that he finds that British technology has withheld its support of castings for rotating members, which is not understandable considering that most of the jet aircraft flying in British skies to-day are employing American-built engines, using investment-cast blades under continuous and severe operating conditions. That British designers will soon be taking advantage of the unique isotropic properties and contour improvements found only in castings is sure, in fact, already such castings have been made for test in one of Britain's newest engines. Blades for turbines are made both in cobalt-base and nickel-base alloys in the US. The well-proved cobalt-base alloys are all cast, while the nickel-base are of the aluminium- and titanium-containing type, most satisfactorily vacuum-cast of vacuum-melted stock.

Intermediate-range Alloys

Increased American requirements for lighter structural members in aircraft and missiles has led to the development of intermediate-temperature high-strength steels to replace so-called light metals in structures travelling at Mach 2+ speeds, with accompanying high friction temperatures. A recent report to the American Secretary of Defence shows tensile properties to 134 tons per sq. in. at room temperature maintaining strengths in the 89 to 122 range at 315 deg. C. (see Figs. 1 and 2).

Precipitation hardenable stainless-steels are coming into real prominence in the US—some of these have been adapted to casting and are quite significant because, in addition to their inherently good



Crosshatched area represents target requirements of airframe and missile manufacturers

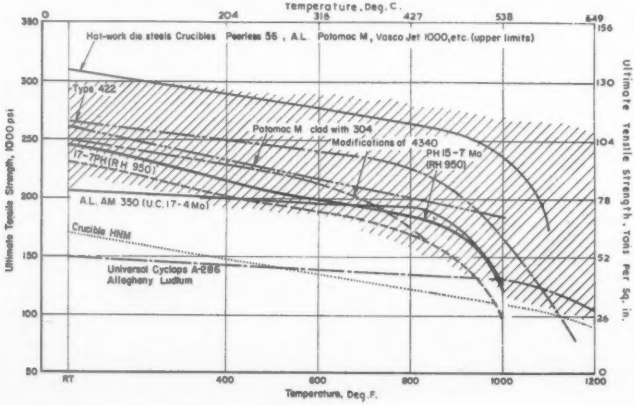


FIG. 1 (*top*).—*Comparison of typical yield strengths of presently available high-strength steels, with airframe and missile requirements.*

FIG. 2 (*bottom*).—*A similar comparison to that in Fig.* 1, *but showing instead the ultimate tensile strengths available.*

TABLE 4.—*Precipitation-hardenable Semi-austenitic Stainless Steels.*

	C	Mn	Si	Ni	Cr	Mo	Al	N	Cu	Patentee.
17-4 PH ..	0.04	0.90	0.70	4.0	16.5	—	—	—	4.0	Armco
17-7 PH ..	0.07	0.60	0.40	7.2	17.0	—	1.15	—	—	Armco.
PH 15-7 Mo	0.07	0.60	0.40	7.0	15.0	2.25	1.15	—	—	Armco
AM-350 ..	0.10	0.90	0.40	4.2	17.0	2.75	—	0.10	—	Allegheny-Ludlum
AM-355 ..	0.13	0.95	0.40	4.3	15.5	2.75	—	0.10	—	Allegheny-Ludlum

These alloys have strengths equal to or better than stainless clad hot-work die steels, and are preferred because of fabrication ease. 17-4 PH and AM-355 have been specifically modified for casting and are being used extensively in the States as castings due largely to their insensitivity to surface decarburization.

properties, they are insensitive to surface decarburization (see Table 4). The importance of this fact is self-evident to the investment foundry. Combining high strength with a fair degree of corrosion-resistance, they are also easily fabricated.

High-strength Structural Steels

High-strength structural steels have been, until very recently, low-alloy steels such as SAE 4130 (C 0.40; Mn 0.50; Si 0.30; Cr 1.00 and Mo 0.20 per cent.), developing yield strengths of 58 tons per sq. in., tensile 67. The trend in the US is to replace these with modifications of SAE 4130 or the new steels shown in Table 4, which permit guaranteeing 100 tons-per sq. in. tensile strength.

Future

The Alloy Casting Institute, an American organization servicing the high-alloy casting field (Ni + Cr 25 per cent., bal. Fe), reports, in a recent survey, that the field for this type of casting in America has a very high potential with the increased use of such alloys in process industries and with the anticipated early advent of gas-turbine-powered automotive equipment.

Old and new cobalt-base super-alloys have lower properties. In the eyes of many engineers, however, more than sufficient justification for the con-

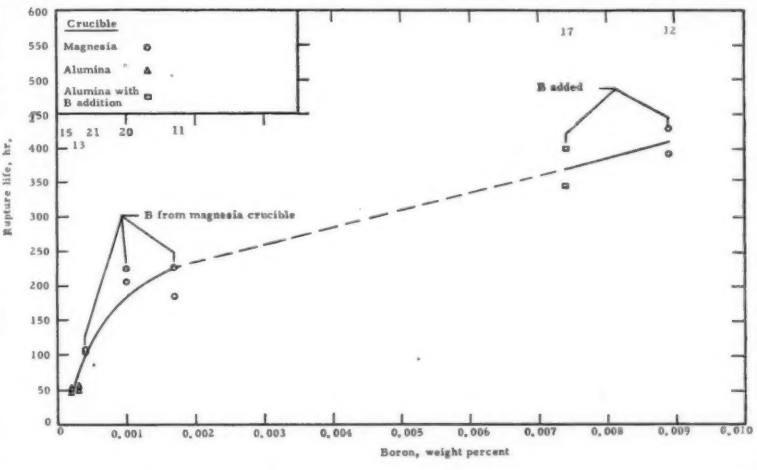


FIG. 3 (*top*).—*Graph showing the effect of Boron content on the rupture life (at 871 deg. C. and 11.15 tons per sq. in.) of experimental heats melted in alumina or magnesia (with <0.01 per cent. Zr). Heat-treatment was 2 hr. at 1,177 deg. C., air cooled. The numbers at the top of the figure identify the heat number for the two data points directly below each number.*

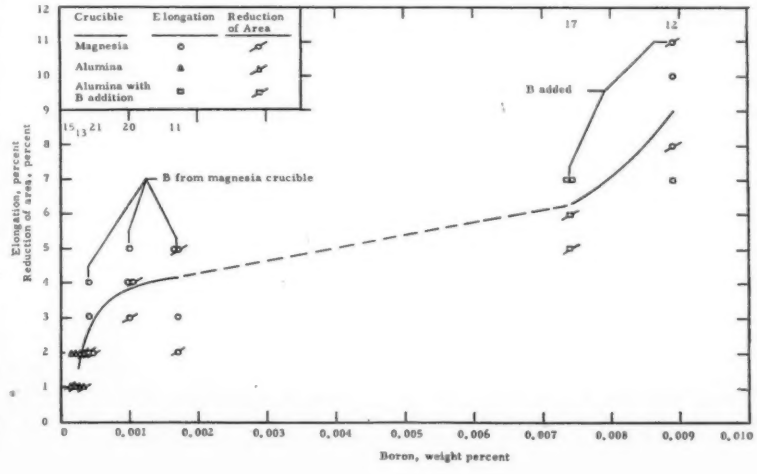


FIG. 4 (*bottom*).—*A similar graph to that in Fig. 3, made under the same conditions of melting and heat-treatment, etc., but showing the effect of Boron content on ductility.*

tinued use of these time-tested alloys lies in the fact that insufficient knowledge of performance mechanisms at elevated temperatures exists, so that years of dependable performance are a safer guide than laboratory tests. This probably accounts for the

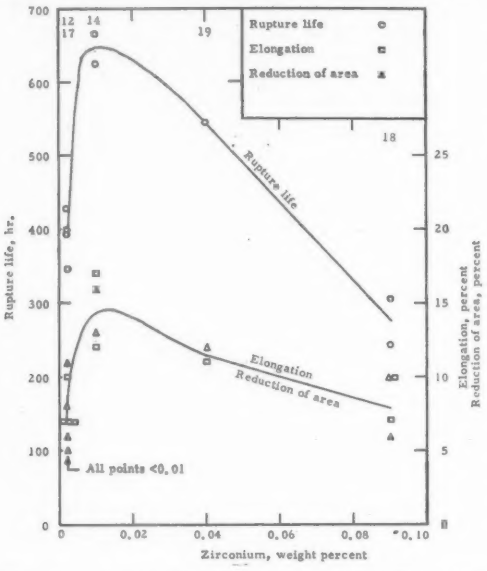


FIG. 5.—*Graph showing the effect of Zirconium on rupture life and ductility (at 871 deg. C. and 11.15 tons per sq. in.) of experimental heats in the presence of Boron contents of 0.0069 to 0.0090 per cent. Heat-treatment was 2 hr. at 1,177 deg. C., air cooled. All heats were homogenized 1 hr. at 1,260 deg. C. before rolling. The heats with <0.03 per cent. Zr were hot rolled at 1,177 deg. C., while the heats with >0.03 per cent. Zr were rolled at 1,093 deg. C. The numbers at the top of the figure identify the heat number for the data points directly below each number.*

remarkable longevity of these alloys in the face of all the research, to develop better alloys for higher temperatures, that has been expended since the advent of the aviation gas-turbine.

Vacuum-melting continues to expand in America, and the better-performing nickel-base alloys are usually vacuum alloyed and vacuum remelted into castings. Much effort has been made to remelt for casting under a blanket of inert gas such as Argon. In most instances, this type of remelting has apparently increased the spread of the performance band. Since the designer of aviation components has a fractional, if any, factor of safety to work with, this means that he must design to the lower limit of the performance band, regardless of averages. Accordingly, present practice in these alloys is vacuum remelting. However, the inventors of the latest of these, Nicrotung, state categorically that it may be satisfactorily cast from a gas-blanket remelt furnace.

Vacuum melting in America took quite a setback in early 1957, with the discovery that 15 ppm. of Boron could influence the stress/rupture life of these newer nickel-base alloys by 100 per cent. It became apparent that property improvements may have been effected more by the amount of inadvertent pick-up of Boron from refractories and other sources than by the vacuum-melting process.

The industry has absorbed this knowledge and actually built upon it, so that to-day there is more vacuum-melting potential in operation than ever before. There is no doubt that vacuum-melted material is finding an expanding place in American metallurgy. One of the newest developments in this regard is a "cold crucible" furnace, so designed that almost no refractories are present to complicate the process. To sum up, America has large sources of both knowledge and equipment for vacuum melting and is designing for, and using, more of this product every day.

American Research

Much reference has been made to research on new alloys—higher-strength, medium-temperature steels and the super alloys for high temperature. The matter of Boron (and Zirconium) influence on the technology of superalloys is so new and so suggestive of the fruits of continued research that the Author will next describe one example of research in this field.

In Figures 3, 4, and 5 will be seen the influence of Boron and Boron + Zirconium on stress-rupture life and ductility of a vacuum-melted 55Ni-20Cr-15Co-4Mo-3Ti-3Al alloy, similar to the Udimet 500 referred to above. Table 5 shows creep-rupture properties for a heat, designated "V," with and

TABLE 5.—*Creep-rupture Properties of Experimental Heats of a 55 Ni-20 Cr-15 Co-4 Mo-3 Ti-3 Al Alloy (at 871 deg. C. and 11.15 tons per sq. in.)*

Heat.	B (per cent.).	Zr (per cent.).	Minimum second-stage creep rate (per cent. per hr.).	Rupture life (hr.).	Elongation (per cent.).	Reduction in area. (per cent.).
V	0.0002	<0.01	0.0160	45	2	1
			0.0060	52	2	1
V+Zr ..	0.0004	0.19	0.0036	147	5	5
			0.0095	134	6	8
V+B ..	0.0089	<0.01	0.0018	429	10	11
			—	394	7	8
V+B+Zr	0.0088	0.01	0.0004	666	17	16
			0.0003	627	12	13

without additions of the critical elements B and Zr. The rupture life increases by over 1,000 per cent. due to these "minor" additions.

The mechanism is well evident in Figures 6-9. First, the massive carbide $M_{23}C_6$ forms in grain boundaries accompanied by gamma prime depletion along the grain boundaries transverse to the applied stress. Microcracks then develop at the interface between the $M_{23}C_6$ particles and the depleted matrix along the transverse grain boundaries,

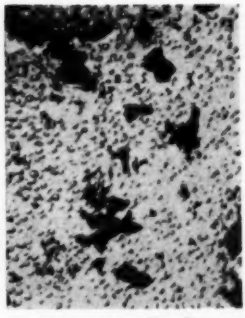
Heat V

Heat V+B

Electron Micrographs

FIG. 6.—1.2 *per cent. creep at* 871 *deg. C. in* 165 *to* 188 hr.

Light Micrograph



Extraction Replica

Heat V+B

FIG. 7.—1.2 *per cent. at* 871 *deg. C. in* 188 *hr.*

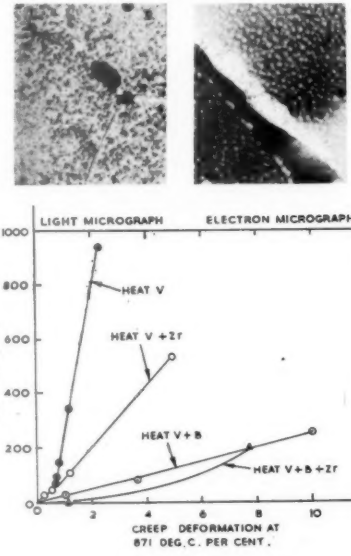


Fig. 8

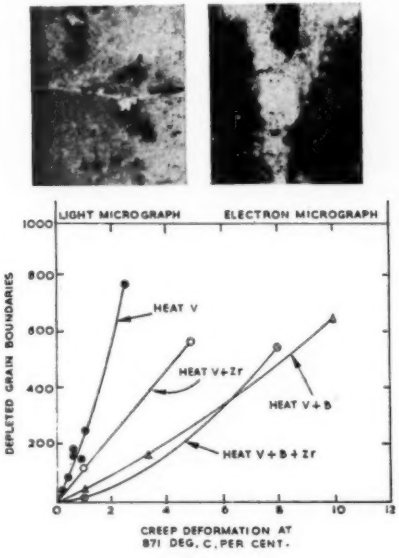


Fig. 9

grow, and finally initiate fracture. Zr alone reduces the rate of the process.

Boron reduces the rate additionally by shifting carbide precipitate type from $M_{23}C_6$ to M_4C, and shifting the position of the M_4C into the grains from the grain boundaries. The $M_{23}C_6$ eventually forms and causes fracture, but the necessity of going through M_4C to $M_{23}C_6$, and for the carbon to migrate to the grain boundaries, greatly retards the process. The onset of cracking was delayed until after the third stage creep. This permitted longer life and more elongation at fracture.

The correct ratio of B + Zr by an interaction effect gives still higher strength. The reactions are the same as for Boron alone—plus increased creep-resistance. Fracture occurs by cracking originating at the surface. These results are mainly important as they show the pronounced effect of minor amounts of certain elements and that there are strong interaction effects. Second, they show how minor elements can act through their influence on either fracture or creep-resistance or both, to have such pronounced results.

There are probably a very large number of reactions which occur. It seems evident, however, that the mechanism is the changing of the types of precipitates, reaction rates, or " cohesion " with the matrix. Creep resistance is probably increased by the trace elements segregating to the " flaws " (dislocations) in the metal.

Boron and Zirconium effects on this alloy were discovered by Dr. J. W. Freeman of the University

of Michigan, and the mechanism studies described above are also his work. It is felt that this type of research is important in developing the stepping stones to more knowledge of the "why" in these complex alloys. Whilst these studies were directed at a specific composition, similar effects are being found in other nickel-base, as well as cobalt-base, alloys.

Selling Investment Castings in America

The most prominent American foundries make it a practice to conduct instruction meetings in private groups of design engineers of a given large company or to public groups of similar designers in connection with a meeting of a technical society. In addition, the Investment Casting Institute has financed a concerted industry effort to publicize accomplishments of the industry. Most effective of these has been the "case-history stories" where comparisons on both product and price are made between castings and other means of fabrication. Publicity is the next step and the most important. In America, trade magazines will publish these as a service to readers, the only cost to the industry being the supply of the facts and illustrations.

Fortunately for castings, the greater need for designs approaching unity safety factor for airframes has led to a questioning of many of the superiority assumptions that wrought products enjoyed until recently. It is now being discovered that to design closer to unity, the isotropic mechanical property of castings as compared to rolled and forged metal is a big plus for castings. So it is that a field that traditionally avoided castings is now evaluating castings in their true light and becoming, in America, at least, one of the most vigorous champions of the use of castings. In America, castings are being sold on their merits, rather than their price.

Development of Corrosion-resisting Investment Castings with Higher Mechanical Properties and Good Weldability

By R. Taylor M.I.B.F.*

The demand for components, in investment-cast form, with high tensile-properties has recently increased. As the scope of the lost-wax casting process has broadened, castings have been produced in a wider range of alloys, e.g., *low-alloy non-stainless steels, ferritic and martensitic stainless-steels, etc. This article deals with the development, by Firth-Vickers Stainless Steels, Limited, Sheffield, of the alloy FV.*520.

The wartime developments which gave rise to the modern industry for the lost-wax casting of aircraft and general engineering components centred on austenitic alloys for high-temperature applications. Whilst the austenitic alloys gave (and continue to give) the best high-temperature mechanical properties, their hardness and tensile-strength properties at room temperature are moderate or poor, relative to fully heat-treated low-alloy steels. In particular, the yield-points of austenitic steels are very low, being of the order of only 17 tons per sq. in., and they cannot be hardened by heat-treatment. However, in the main, the austenitic alloys exhibit excellent corrosion-resistance, castability and weldability, and large-scale use is made of them in producing lost-wax castings for many different purposes, notwithstanding their characteristically low yield-point and hardness.

In recent years, the demand for components with high tensile-properties in investment-cast form has become more marked and, as the scope of the lost-wax casting process has broadened, castings have been made in a much wider range of alloys, including low-alloy non-stainless steels, and ferritic and martensitic grades of stainless steel. This article deals with one of these more recent developments.

Castability and Related Problems

Alloy-range Extension caused Troubles

It is probably true to say that when lost-wax investment founders extended the range of alloys cast, they were dismayed to note the appearance of two undesirable features. First, many alloys, including certain stainless alloys, yielded unsightly slag-contaminated and highly-oxidized surfaces; second, the latitude of casting design, apparently possible with the austenitic type of alloy, was significantly restricted in the case of other alloys tried, on account of the greater incidence of corner-tearing and excessive local feeding-shrinkage, etc. This is, of course, the visible local porosity, cracks, tears, etc., found in corners, recesses and changes of section generally.

When one considers the general complexity of shape of investment castings and the fact that, in the vast majority of cases, only one ingate or feeding point is used, it is perhaps surprising that this trouble is not encountered much more often. If one required almost any legitimate investment-casting shape to be cast many times larger than normal, *i.e.*, in cwt. or lb., instead of oz., the running and feeding system would have to be greatly elaborated whatever the type of mould and method of casting. This is due primarily, of course, to the change in the scale of mass involved, with its consequent effect upon time/temperature relationships. For the range of investment castings weighing less than a few ounces a conventional foundry feeding-system would be particularly impractical, or uneconomic, or at best extremely inconvenient.

By a most happy combination of circumstances, the hot-mould facilitates sharp running and minimizes cooling stresses. However, despite the very hot mould, the small mass and generally large ratio of area to volume give rise to a sufficiently rapid rate of solidification that only one (or maybe two) ingates suffice for efficient running and feeding in the vast majority of cases—auxiliary feeds, risers, etc., being required comparatively rarely.

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* The Author is production manager of the investment foundry of Firth Vickers Stainless Steels, Limited, of Sheffield.

Effect of Alloy Composition

There is one further all-important factor affecting the ability to cast complicated shapes of varying section (albeit on a small scale), with comparatively simple running and feeding arrangements. This factor is, as already indicated, the alloy composition. Considerable experience has shown the profound importance of the effect of certain elements on the incidence of slag contamination, severe oxidation and corner-tearing, or severe local shrinkage and/or cracking at locations where the design of the casting causes hot-spots.

Definition of Investment-castability

Good " investment-castability " of an alloy may then be defined as its ability to produce reasonably clean, smooth (preferably silver-grey) cast surfaces, with very little or no tendency to tear at corners, changes of section and local areas of heat-concentration, etc. As indicated earlier, the austenitic class of stainless alloys generally has excellent castability, whereas the martensitic and ferritic grades, particularly the latter, have inferior castability. The composition of even the austenitic grades of steel can vary to the point where the investment castability becomes poor, although apparently nothing else is effected, and it was found necessary several years ago to draw up special specifications for the procurement of steel stock for remelting, in order to keep the alloy compositions of even this class of steel close to the ideal for good castability.

Arc-furnace *versus* Radio-frequency Melting

Early Development centred on Indirect-arc Furnace

The early development of the modern lost-wax-castings engineering industry was centred on the indirect-arc type of furnace, the mould being clamped over the taphole so that the melt ran direct from the crucible into the mould cavity. Such excellent results were obtained with respect to clean casting surfaces, when using the austenitic alloys, that the idea grew up that the carbon-arc produced a reducing atmosphere that prevented or inhibited the formation of oxides or slag.

When ferritic and martensitic stainless heats were made repeatedly from an originally virgin crucible, however, it could be observed that sooner or later the clean melts were followed by " dirty " ones of varying, but generally progressively worse, severity, the cast surfaces becoming correspondingly afflicted with unsightly blotches and stringers of slag. Thus the idea that the carbon-arc atmosphere might work equally well with all alloys was quickly dispelled.

Radio-frequency Melting allows more Metallurgical Control

The first major step which had to be taken, therefore, to overcome the comparative lack of metallurgical control on casting the ferritic and martensitic grades of stainless steel from the conventional arc-furnace, was to adopt radio-frequency melting, by means of which atmosphere-, temperature-, carbon-content-, and slag-control can more readily be effected.

New Alloy Needed

When the range of alloys used for investment castings was widened, to include the ferritic as well as the martensitic stainless-steels that were hardenable by heat-treatment, further complications arose in addition to the castability problems. These were the incidence of poor weldability, and the fact that the heat-treatments to induce high mechanical-properties could either seriously impair the corrosion-resistance potentialities of an alloy or, in the case of low-alloy steels, destroy the precision dimensions as a result of oxidation at the heat-treatment temperature. It thus became clear that the answer to the engineers' problem was an alloy that satisfied *all* the following demands:— (1) Heat-treatable to give high mechanical-properties, *viz.*, high yield or proof stress with adequate ductility; (2) high corrosion-resistance; (3) good weldability, and (4) available also in the form of investment castings of at least a reasonable standard.

Advent of FV.520 Alloy

Faced with this challenge, the investment foundry of Firth-Vickers Stainless Steels, Limited, took advantage of the great progress made towards a solution of this problem by the advent of a new alloy, FV.520, which had been developed by the company's research department. A typical composition of this alloy is as follows: C 0.06; Si 0.7; Mn 0.7; Ni 5.5; Cr 15.0; Cu 1.5; Mo 2.0 and Ti or Cb 0.1/0.5 per cent. FV.520 gives high tensile-strength and yield points; has corrosion-resistance equal to that of the austenitic stainless-steels of the 18/8 type, and has good weldability and lower thermal-expansion, and better machinability than that of austenitic stainless. It need hardly be said that work was put in hand immediately to develop a reasonably successful technique for the production of investment castings in this type of alloy.

Alloy Composition modified

To develop a reasonably successful technique for the production of investment castings in the new alloy, modifications of alloy composition were found to be necessary. These modifications were small changes but significant ones, and involved practically all the alloying elements. Trial castings were made, and some of them cut up for examination and tests. Small test-piece blanks were cast to enable the mechanical properties to be checked and to confirm that the best heat-treatment procedure was being used.

Heat-treatment, Weldability, and Mechanical Properties

Details of the range of tensile-stress properties obtainable by appropriate heat-treatment variations are given in what follows. Fig. 10 illustrates the heat treatment-induced precipitation, *i.e.*, secondary hardening, reactions of this alloy. As can be seen, peak hardening occurs on re-treatment in the

region of 450 deg. C., but the author's company prefers to apply a final treatment in the region of 550 to 600 deg. C. Additionally, excellent weldability was demonstrated in the following manner. Three pairs of Hounsfield test-piece blanks were Argon-arc welded with FV.520 filler wire, after each piece had received full heat-treatment. After welding, the three assemblies were given a 550 deg. C. stress-relief treatment. On subsequent tensile testing, the fracture occurred in the parent metal in each case, and highly satisfactory test results were obtained, as shown in Table 6.

TABLE 6.—*Weld-test Mechanical Properties obtained After Stress-relief Heat-treatment of FV.520.*

Yield point.		Maximum stress.		Elongation, per cent.	Reduction of area, per cent.
Kg. per mm.²	Tons per sq. in.	Kg. per mm.²	Tons per sq. in.		
67	42.6	106	67.3	9	21
68	43.1	107	68.0	9	21
67	42.6	106	67.3	7½	16

Validity of Test-piece Technique

With regard to the age-old controversy concerning the significance of results obtained from

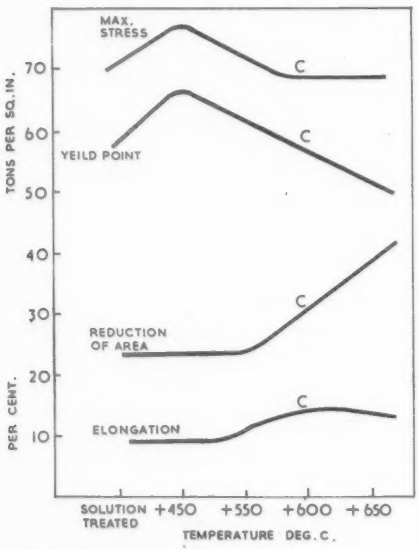


FIG. 10.—*Diagram showing the heat-treatment-induced precipitation (secondary hardening) features of the FV.520 alloy.*

separately-cast test-pieces, it is interesting to note that a certain investment casting with a fairly heavy base (Fig. 11) has been heat-treated (with 600 deg. C. final temper) and then cut up, to provide a Hounsfield test-piece identical with those machined from the cast tapered blanks. The properties recorded on this test-piece were: Yield point, 59 tons per sq. in.; maximum stress, 68 tons per sq. in.; elongation, 14 per cent., and reduction of area, 30 per cent. As can be seen, these values from the specimen casting are very close to the average of those obtained from the cast test-piece blanks (see Fig. 10, points "C"), in spite of the relatively large difference in mass.

Role of FV.520 Investment Castings

Fig. 12 illustrates to some extent, the great advance that has been made. The FV.520 material, unlike the well-known martensitic stainless-steel containing CO 0.15; Ni 2 and Cr 17 per cent., is comparable in corrosion-resistance and weldability with the three austenitic stainless-steels for which results are plotted and which, as can be seen, have much inferior tensile-properties, in particular the yield point (the designers' generally all-important criterion). A further notable advantage of FV.520 for certain applications is its much lower coefficient of expansion compared with the austenitic steels, as shown in Table 7.

TABLE 7.—*Comparison of Austenitics', and FV.520, Linear Coefficients o Thermal Expansion.*

Austenitic steels. ($\times 10^{-6}$ in. per in. per deg. C.).	FV.520 alloy. ($\times 10^{-6}$ in. per in. per deg. C.).	Temperature range. (deg. C.).
15 to 17	12	20 to 100
16 to 18	13	20 to 300
17 to 19	13.5	20 to 500

The opinion has been expressed that, as the designers' demands are forever raising the standard of properties required, sooner or later no cast object, however heat-treated, will compete with the wrought object which can have its structure refined by hot working. The author believes the development of this new stainless-steel will considerably extend the range of application of investment castings.

Conclusion

Not so very long ago, there were two sharply-divided classes of stainless-steel—the heat-treatable and the so-called non-heat-treatable, each with their distinct advantages and disadvantages. The engineer has frequently had to compromise on this account: It is now possible, however, due to the development of FV.520 steel, to achieve a balance of good physical and mechanical properties, in some respects superior to those obtainable from the old martensitic stainless-steels, combined with the excellent corrosion-resistance and good weldability that formerly were to be obtained only by using the softer austenitic stainless-steels. Furthermore, investment castings of an excellent standard can now be produced in this material.

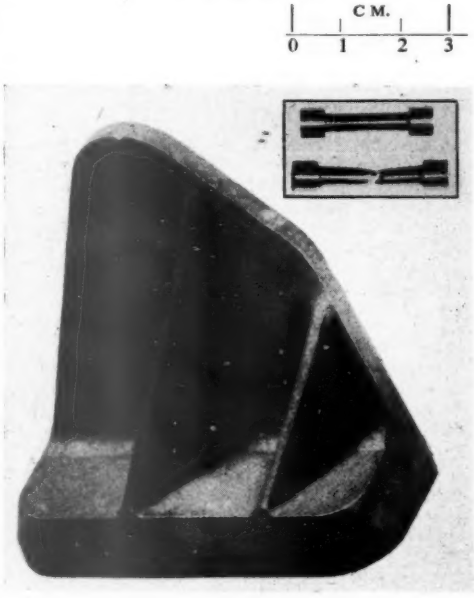
Discussion

In a discussion which followed the presentation of the the above paper, Mr. Taylor was asked whether the special steel referred to was for purchase as remelting stock. He answered that it was

only available by special arrangement with the government, although it had of course been patented. Experience was being gathered before bringing it further into the market.

A further questioner stated that in USA a 25-Cr 4-Cu alloy had been developed which gave up to 65 tons per sq. in. tensile strength; how did this compare with the Firth-Vickers alloy? Mr. Taylor referred back to Fig. 10, which showed an average of 69 tons per sq. in. on investment-cast specimens with adequate ductility, and added that in rolled-sheet form, strength of up to 90 tons per sq. in. had been obtained in FV.520 steel.

FIG. 11.—*Test casting, with a fairly heavy base, in FV.520 alloy. This casting was cut up to provide a Hounsfield test-piece identical to those machined from cast blanks.*



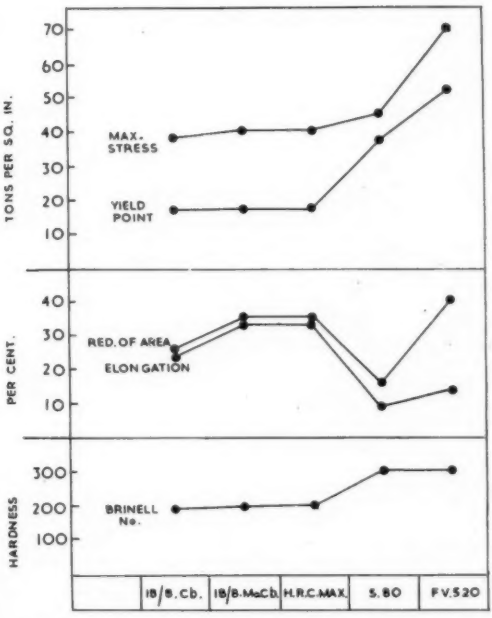


FIG. 12.—*Comparison of the mechanical properties of FV.520 and other stainless steels.*

In further discussion Mr. Taylor showed the influence of manganese and silicon additions on stainless steels. Typical faults in high-chromium alloys (slagdrops on the surface), due to (*a*) too-high manganese, and (*b*) too-low silicon (hot tears), were also commented upon. Mr. Taylor continued by saying that if one raised the silicon content and lowered the manganese content, it was possible to get better definition through the absence of surface scum, and complex shapes could be run and fed comparatively simply by the alleviation of hot-tearing problems. He concluded by referring to manganese as the investment-casters' enemy, and to silicon as his friend.

Bearcomo Steel wins Brussels Award

Special steel for nuclear reactors, exhibited by the Consett Iron Company, Limited, has been awarded a gold medal at the Brussels International Exhibition of Inventions which ended recently. The steel, which is known as Bearcomo, is being used in 4-in. thick plates for the nuclear reactor shells at atomic power-stations at Bradwell (Essex) and Latina, Italy.

A number of features are demanded of the steel used for such purposes, but above all it must be resistant to fracture during fabrication to ensure leak-free pressure vessels and it must be resistant to "creep" which tends to take place at the high temperatures at which it has to operate. Considerable research over a long period had to take place at Consett before the marriage of these two properties could be successfully accomplished.

Glasgow's Smoke Control Zone

One objection has been lodged against the proposal to set up a smoke control zone in the central area of Glasgow, but this is not expected to delay its establishment by October 1 next. March 23 was the final day for the lodging of objections, and the Order declaring the area a smoke control zone will now be submitted to the Secretary of State for confirmation. The Order takes effect six months after confirmation.

The scheme affects more than 4,000 premises—domestic, commercial, and industrial—and it is estimated that it will cost about £25,000 to adapt dwelling-house fireplaces. The first of a series of meetings for the occupiers of the 366 houses in the area was held last week in the City Chambers, when the proposals were outlined and many kinds of smokeless appliances, including fireplaces and gas and electrical units, were exhibited.

Patterns in Plastic

The accompanying illustration shows a collection of plastic patterns produced by F. Wilding and Company, Limited, of Roker Industrial Estate, Oldham, for the shipbuilding industry. The new patterns are claimed

to be quickly and easily cast, to have good abrasion resistance, and not to warp. They are 60 to 80 per cent. lighter than similar metal patterns, corrosion resistant, and, if accidentally damaged, can be easily repaired.

Mechanical Handling Federation

Section II (continuous conveying equipment) of the *Fédération Européenne de la Manutention* (European Mechanical Handling Federation) held meetings in Nice on March 18, 19, and 20, and there were present delegates from Austria, Belgium, France, Germany, Great Britain, Italy, Saar, Sweden, and Switzerland. The meeting of the section was presided over by Mr. F. S. Stent (Great Britain).

It was announced that the first edition of the "Illustrated Terminology" had been published in the English, French, German, Italian, Spanish, and Swedish languages. This dictionary, which contains 64 pages, illustrates various types of continuous mechanical-handling equipment and ancillary apparatus and embodies the appropriate nomenclature in the six languages in question. Prints of the publication are available from Compagnie Française d'Editions, 40, rue du Colisée, Paris 8e, price F.Frs. 650 (9s. 6d.), plus postage. It was also stated that considerable progress had been made with regard to the second edition of the dictionary. This will feature the principal component parts of continuous conveying apparatus and will be presented in loose-leaf form.

The next meetings of the section are to be held in Lucerne in September.

AN EXHIBITION, organized by Dexion, Limited, Maygrove Road, Kilburn, London, N.W.6, to launch new products of the company, is to be held at Stonebridge Park, Wembley, from May 26 to 29 and from June 2 to 4. It will be open daily from 9 a.m. to 7 p.m. Galvanized Dexion slotted angle is one of the products to be shown for the first time.

Aluminium Oversupply for Next Few Years

Even with a resumption of recent consumption growth rates, the aluminium-producing industry must look forward to a condition of oversupply for the next few years until a further rise in demand restores the balance, states Mr. N. V. Davis, president of Aluminium, Limited, in his annual report.

Capital outlays in 1958 under the company's expansion programme amounted to $103,000,000, principally towards completion of the latest facilities for hydro-electric power and the production of alumina. Total smelting capacity in the free world increased by about 500,000 tons to 4,100,000 tons, but at the year-end a significant part of the free world smelting capacity was still idle. Aluminium's principal subsidiary, the Aluminum Company of Canada, Limited, operated at about 22 per cent. below installed capacity of 770,000 tons per annum in 1958, and in January continued increase in metal inventories dictated another reduction to 68 per cent. of installed smelter capacity.

Aluminium's net income for the year fell from $41,400,000, or $1.37 per share, to $22,400,000 or 74 cents. Sales and operating revenues amounted to $422,900,000 ($453,500,000) and consolidated sales in all forms dropped to 581,195 (614,210) tons. Net income of Alcan was $20,100,000 ($26,498,359).

Steelworks in Backgarden

Steelworks in the backgarden was one of the sights which impressed Mr. W. T. Vizer Harmer, commercial director of the Steel, Peech & Tozer branch of the United Steel Companies, Limited, who has just arrived back from a three-week tour of Communist China. "People melt down local scrap with iron ore in their backgardens and smelt it with coke or charcoal," he said.

In contrast Mr. Harmer visited China's biggest steel centre at Anshun where he found modern works in operation. In production, he said, China, which has a home output of about 4,000,000 tons a year, was still far behind the rest of the world. "If she quadrupled her steel production, she would still want a lot more. Her needs are limitless and her foreign purchasing will be governed only by the availability of foreign exchange."

Mr. Harmer was for 20 years general manager of an Indian iron and steel works.

English Electric Again underbids US Rivals

Once again the English Electric Company, Limited, has underbid its nearest US competitor for a US Army Corps of Engineers hydro-electric project by over 12 per cent. Tenders were submitted for four 36,111 kva water-wheel generators and the English Electric bid was $4,496,746. The Swiss company, Brown Boveri, was next with $4,785,120, and US General Electric was third with $5,294,309.

The project which is for power supply at Barkley, Kentucky, is the first since the Greer's Ferry case and also the first set of tenders involving UK concerns to have been published since Mr. Macmillan's recent discussions with President Eisenhower. It may be regarded as being a test case by the British Government.

Foremanship Training in the British Foundry Industry*

By F. C. Hayes

Definition: "A foreman represents the level of management which either directly or through working charge-hands, controls labour." This article describes the organizations in the United Kingdom, both within, and outside, the foundry industry, which cater for the education of foundry administrative personnel.

National training systems are greatly influenced by the educational system of the country in which they are set. This is particularly true of the UK, which has developed a division of responsibility between industry and the state which arises from the nation's long industrial history and the high level of skill of its population.

Part-time Courses

There exists in Britain an extensive system of part-time education, both technical and cultural, and courses are available at a nominal cost, or free, to all who wish to undertake them. Subjects include not only metallurgy, engineering, and foundry work, but also languages, music and painting, as well as economics, work study and industrial administration. This means that by and large industry does not undertake the technical education of its personnel, particularly since education authorities are obliged by law to provide courses in any subject for which there is a demand. There is the closest liaison between industry and the colleges, which work together to ensure that courses which are provided meet a real need, and that standards and content are educationally sound and industrially appropriate.

Another factor affecting foreman training in the UK is the fact that the status of a professional engineer or metallurgist is awarded by independent Professional Institutions, and is gained by attaining certain academic standards *coupled with* practical experience. These academic standards can be reached through study at one of the British universities which have technical faculties, a college of advanced technology, or by part-time study.

Grants and Scholarships

Particularly since the war, full-time education at universities and technical colleges has been available, to all who have sufficient ability, through an extensive system of grants and scholarships of between £300 and £400 per annum. Over 75 per cent. of all university students are thus maintained. More and more boys are therefore staying on at school till the ages of 16, 17 or 18, as all secondary education is free. Many of these continue their education and do not enter industry until they reach the age of about 22. The entry into industry at the age of 15 is tending more and more to be restricted to the less intelligent boy.

Distinction between Older and Younger Men

The above factors have a great effect on the problems of foreman training, and there is beginning to appear a distinction between the older men, say over 35, and the younger, say under 30. This is clearly expressed in the comments of one foundry, which shall be nameless:

"It can be said in general that the older type of foreman was of elementary school education, and spent his earlier years in the foundry industry as a craft apprentice, thence graduating to the status of a skilled worker. He was then selected as a foreman, not because he was the best skilled worker in that particular shop but because he showed signs of initiative and leadership, coupled with a good natural intelligence."

As to the younger type of foreman, he is essentially of GCE or near-GCE standard of intelligence and education, *i.e.*, of a type who should profit from continuing his technical classes. Recruited in the 17 to 20 age group, he receives shop-floor training for five years, a typical schedule being as follows:

Patternshop	Six months
Methods Department	Six months
Moulding Departments (hand and mechanized moulding)	Two years
Core Shops	Six months
Fettling Shops	Six months
Inspection Department	Six months
Radiological Department	Six months

During this time he spends one day and two evenings per week at continuation classes in either engineering or metallurgy, and at the end of his five years he is given an assistant supervisory position on the shop floor, preparatory to taking over as a shop foreman at, say, 25 years or over, depending upon his rate of progress and a suitable vacancy arising.

No Bar to Promotion

There has never been a bar to promotion from the shop floor to foremanship, and from there to management. In fact many foundry managers have gone through this process, but the majority of the "old type" foremen have reached the climax of

* Report by the Training Committee of the Council of Ironfoundry Associations. The author is Education and Training Officer of the Association.

Foremanship Training in the UK

their careers. Many of the younger men have gone through a course at the National Foundry College, which demands as one of the conditions of entry at least one year's practical experience in moulding. For them foremanship is tending to become a stage during which they acquire practical experience, and from which those who have the right personal qualities may expect to rise in due course to management positions.

Technical Education

National Foundry College

As mentioned above, many of the younger foremen are expected to be eligible for higher posts in due time, and an increasing number of them have gone through the National Foundry College. The most appropriate course for them at the College lasts two years and includes a period of six months suitable works experience. Subjects studied include foundry metallurgy, foundry technology, foundry management and project work.

Bolton Technical College

A two-year " sandwich " course for foremen from smaller foundries is held at this college. Under this arrangement students spend alternative periods of six months at the college and six months gaining practical experience.

Constantine Technical College

A two-year sandwich course leading to the award of a College Ordinary Diploma in Foundry Technology and Patternmaking. Though not specifically aimed at foremen or potential foremen, it is used by local companies as a valuable means of selection.

Institute of British Foundrymen

The IBF is the professional organization of all those with responsible positions in foundries, and numerically the largest part of its membership is made up of foremen. By means of its many branches throughout the country, it arranges meetings on technical subjects, works visits and a special Foremen's Training Course. It also publishes Proceedings for its members, and is probably the most important agent in keeping the working foreman technically up to date.

Ad-hoc Lectures

Many technical colleges in foundry areas hold, from time to time, series of evening lectures on new developments in foundry techniques. Though some of these are at an advanced level, many are specially designed to appeal to foremen.

Training of Potential Foremen

The training of potential foremen takes many forms, depending on the size of the company and its location, and many other factors. It should, however, be said at the outset that, though large companies may have better facilities for *formal* training, the most important element in producing a good foreman is the personal " coaching " by the foundry manager or his assistant, this practice being often more effective in the smaller firm.

In the UK, technical competence of the potential foreman is assumed (sometimes unwisely), and all efforts are concentrated in fitting him for his new role as part of the management team. In this process the greatest contribution is made by the guidance received from his superiors.

Company Training

One large company adopts the following measures: (1) Selection of foremen from candidates selected by works management after tests, group discussion and interviews. (2) Short course of one week for potential foremen, introducing the question of supervisory responsibilities, dealing with people, and some company background. (3) Posting for further supervisory experience in a department other than the one from which they were selected. (4) Attendance at the two weeks' residential course for new foremen.

Training Facilities Outside the Foundry Industry

Over 50 technical colleges and institutions provide courses, of varying content and length, which are specifically designed for foremen and potential foremen. The courses vary from short series of evening lectures held during winter sessions, to longer courses, which are often for the Certificate of the British Institute of Management (an independent body).

The Certificate in Foremanship and Supervision of the British Institute of Management can be obtained on completion of a two-year part-time course, after passing a written examination. This course is open to foremen in all industries. 421 of these certificates were awarded in 1957/58. The first year of the BIM syllabus can be covered by one session of two hours each week during three terms, and includes the following three subjects: Elements of supervision; industrial history, and English. The second year is similarly arranged and has four subjects: General principles of foremanship and supervision; elements of labour management; principles of production and planning, and principles of remuneration, estimating and costing.

Training of Established Foremen

The most urgent and difficult problem for the British foundry industry is that of improving the standards of existing foremen. Because the foreman is in direct contact with labour, he is a key man in: the training of apprentices and trainees; accident prevention; maintenance of good labour relations; smooth introduction of work study, and in the general technical efficiency of the men in his charge. It must therefore be repeated that the development of foremen, like that of any other managers, must be the constant responsibility of their immediate superiors in line management and, whilst specialists such as personnel officers and training officers can contribute much through their special knowledge, it is the day-to-day coaching, comment, criticism and encouragement which are the essence of their training. It is the foundry manager who sets the standards to which the foreman has to work, and if these standards are bad no course of lectures can be expected to improve the foreman's daily performance.

Supplementary Schemes

The form of supplementary schemes varies widely, but again most of them are concerned with improving the ability of the foreman as a manager rather than his technical competence. They are usually residential, varying in length from one to three weeks, and arranged by the company if it is large enough (or part of a wider group), but often run on a co-operative basis such as those organized by the Council of Ironfoundry Associations. These courses may include sessions on: Work study; accident prevention; human relations; training; costing; job instruction, and communications, etc. A feature of such courses which is receiving more attention is the use of projects and case studies, and it might be useful to explain what is meant by these terms in the UK.

Projects and Case Studies: A project is a synthetic situation based on one, or a combination of several, real case histories. It may consist of a description of a foundry, a section of it perhaps in considerable detail. Due to amalgamation with another foundry certain measures of reorganization and expansion involving the installation of new equipment are to be taken. A series of problems arising from these technical changes is put to groups of foremen acting as advisory committees. They are asked to produce reports on: the maintenance of production during alterations; labour problems likely to ensue; manning and training, and accident prevention. The foremen are required to analyse situations critically, and to discuss human problems arising out of a technical change in a concrete situation. Such courses have had an unquestionable success, not least because of the opportunities for informed exchange of experiences which are possible at a residential course.

What's the German Foreman Like?

By R. M. Lockwood Marsh

Reprinted from *Foreman No. 7*,* this question-and-answer article—the questioner being presumably a British foreman—explains how the German foreman works, and comments upon the problems he has to face. In addition, the industrial set-up in Germany, its unions, and promotion schemes, etc., is described.

How do you mean—what's he like?

Well, is he the same sort of chap as me? Has he got the same type of job? Does he come up against the same problems as I do? Does he . . .?

Steady on. Let's take those one by one. Yes, he's like you in that he's a practical man, who's got to translate all the policy, the planning, the inquiries, quotations, specifications and everything else into physical actions by people on the shop floor. And like you, he's probably in direct man-to-man control of more people than any other level of management in industry.

That's all very fine and theoretical, but doesn't get me much further. Are you saying he's just like me? Could we swap jobs?

Oh, no, I wouldn't go as far as that.

Well, then, what are the differences between us?

I think perhaps if I tell you a little about the general background in Germany first, then maybe the differences will come out more clearly.

All right, carry on.

First of all there's the general political and economic set-up. I don't want to go into this in too much detail, but, as you know, German industry by the end of the war was pretty well in ruins and in fact the whole life of the country had to start again more or less from scratch.

Yes, I saw some of that before I was demobbed.

Oh, did you? Well, you'll know what I mean, then. This starting from scratch was obviously a tremendous job, which raised innumerable small problems. But in the long run the Germans got considerable benefits from it, because they could lay out their factories just as they wanted and could order the most up-to-date machines available.

They had a lot of American aid too, didn't they?

Yes, they did, but there are a lot of people who don't realize that in fact in the ten years after the war we in the UK and the colonies got nearly half as much money again in loans and grants from the States as Germany did.

Well, I never knew that.

There are a lot of people who don't. But still it doesn't alter the fact that the Germans, because of the destruction, were in a position to make very good use of the aid they did have.

That's the practical side of it. What about all this one hears about the Germans working so much harder than we do?

Of course, in the years immediately after the war, there was an enormous incentive to work hard, because people were literally working to rebuild their lives, their homes and their country. But by now, the tempo has slackened off a bit. Working hours aren't much longer than here. All the same, I think it's fair to say that the ordinary German worker sticks at his work more consistently than people do over here. Perhaps that is something which may make life simpler in one way for the German foreman.

I should think it would do. Lucky chap!

There's another side to this morale business, though, which I think is equally important, although, in the way it works out in practice, it may complicate the German foreman's life.

* Published by the Industrial Welfare Society; price 2/-.

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What's the German Foreman Like?

Well, I'm glad to hear life isn't all a bed of roses for him.

As a result of the war and the aftermath, the Germans seem to have come to the conclusion that they have just got to stick together and not let any quarrels between different sections disrupt the general process of economic recovery and development. They accept the fact that, for instance, workers and employers will disagree, but they have tried to devise a system for sorting out the problems before they go too far. Of course no system works unless people want it to and, as I say, the Germans have got to the stage where they're prepared to approach disputes objectively on their merits.

I'd like to hear about this system.

The Germans have had years of experience of joint consultation and the present system, which incidentally is imposed by law, makes use of that experience. Actually it was introduced after the war with considerable encouragement from the British Government. The idea is that every firm has to have an elected workers' council, which is elected by all employees, regardless of whether they are union members or not.

That's the first time you've mentioned unions.

Yes, I'll tell you a bit more about unions in a minute. This workers' council in fact is something like a shop stewards' committee in this country. It negotiates with management on the application at factory level of national or industrial wage agreements, working conditions and so on. It is also the channel by which management puts over information about policy, introduction of new methods, etc. It also has a certain say in welfare and similar matters, for example, the allocation of company houses. And it has the veto over hire and fire of workers.

What?

I thought that would shake you. Yes, the management cannot dismiss or take on anybody without the approval of the workers' council.

But that hits right at the authority of the boss—and the foremen, come to that!

Well, I told you the German foreman had some complications in his life. But you see, this comes back again to what I was saying about the German's belief that they must stick together and approach disputes objectively. This system obviously gives the employees considerable responsibility, but, as often happens when you treat people as responsible individuals, the workers' councils on the whole do not appear to abuse their powers. Actually they also have representatives on the supervisory council (that's a sort of permanent shareholders' committee) and in the coal and iron and steel industries they choose five out of eleven people on the supervisory council, management have five and there is an independent eleventh man. And this supervisory council elects the board of management of three people (more like our board of directors) of whom one is a workers' nominee, who acts as personnel director, but has joint responsibility with the other two on all board decisions.

They certainly give the workers a big say in what goes on. What about the unions?

Basically there is one trade union, with sixteen branches for different industries. There are no craft unions—and that's probably a help to the foreman.

You mean no demarcation troubles. I can see that's a help to him. But if there are no craft unions, what happens about apprentices?

Apprentice training is highly organized, effective, but a bit narrow. The central chamber of commerce works out, with the unions and the government, syllabuses for about 600 different trades. The term of apprenticeship is three years and at the end the boy or girl has to take an examination, again laid down centrally, before getting a certificate which is then recognized by any employer. German industry takes its apprentice training very seriously. Most German foremen will have served an apprenticeship, but that's probably the only training they will have had.

You mean there's not much training in foremanship and so on?

Nothing like as much as in this country. Very few companies run their own training courses for foremen and though there are some organizations (employers' associations and bodies like the IWS) which run residential courses, the idea is not as widely accepted as in Great Britain.

Does that mean the foreman is not likely to get promotion any higher?

Yes, I thing it does. It seems to be felt important for anybody in a managerial position to have some technical or commercial degree or diploma. In practice, management seems to be pretty efficient and many firms have highly developed production planning offices which probably do quite a lot of detailed work that here would be left to the foreman.

So the foreman has less responsibility than over here?

Of course, it's terribly difficult to generalize, but I think that's probably true.

Still, one way or another, German industry seems to have done a pretty good job, and I suppose the foreman has helped in that.

Oh, yes, and I think perhaps the men under him still think of him as one of themselves more than the British worker does of his foreman.

Yes, that's one of the hardest things about getting moved up to foreman: you're bound to lose touch with the lads a bit. But, to come back to German industry in general, do you think they'll go on in the same way, or are they likely to run into labour troubles which may upset the progress they've made?

I think it's very unlikely. Lately they've been having quite a bit of short time and seem to be weathering it. I think we've got to accept them as permanent and very efficient competitors. But, on the other hand, the more prosperous they become, the better market Germany may be for our products.

BICTA's First Annual Conference

Details of Programme for May 11 and 12.

The first annual conference of the British Investment Casters' Technical Association is to be held at the Connaught Rooms, Great Queen Street, Kingsway, London, W.C.2, on May 11 and 12. A programme of technical sessions has been arranged and ample time will be allowed for discussion of the papers. The annual dinner will be held on the first day of the conference, when Mr. L. R. Beesly, Director, engine production, Ministry of Supply, will be the principal guest. It is hoped that this will be the forerunner of many more functions of this nature.

Investment-founding companies are invited to nominate as many representatives and guests as they wish to attend any part of the conference, subject to the payment of the registration fee in respect of each person attending any of the technical sessions. Those who wish to participate are requested to make their own hotel reservations, and in this connection, the Waldorf Hotel, Aldwych, London, W.C.2, and the Strand Palace Hotel, London, W.C.2, have agreed to keep a number of rooms for those who mention the Association when making reservations before April 18. Application forms should also be completed and returned to the Association, 5, East Bank Road, Sheffield, by April 18.

Programme

Monday, May 11

2.30 *p.m.*—Annual general meeting (members and associate members of BICTA only).

3.45 *p.m.*—Opening address by the chairman of the Association, Mr. D. H. Armitage, P.I. Castings (Altrincham), Limited.

3.50 *to* 5.15 *p.m. Technical session No.* 1—Chairman: Mr. R. W. N. Danielsen (Deritend Precision Castings, Limited): "Investment Castings and Some Aspects of their Costs," by W. S. Fowkes (H. & F. Precise Castings, Limited), followed by discussion.

7.15 *for* 7.45 *p.m.*—Annual dinner (members, other investment founders, and their ladies).

Tuesday, May 12

9.15 *to* 10.45 *a.m. Technical session No.* 2—Chairman: Mr. G. A. Tomkinson (D. Napier & Sons, Limited): (1) "Investment-casting Alloys for Service at Elevated Temperatures," by D. R. Wood (Mond Nickel Company, Limited). (2) "Mechanical Properties of Some Investment-cast Cobalt-base Alloys," by M. Riddihough (Deloro Stellite, Limited), followed by discussion.

11 *a.m. to* 12.30 *p.m. Technical session No.* 3—Chairman: Mr. N. Walker (Hadfields, Limited): "Atmospheric Dust in Investment Foundries," by C. M. Stoch (British Steel Castings Research Association), and discussion.

2.15 *to* 4 *p.m. Technical session No.* 4—Chairman: Mr. W. Fovers (H. & F. Precise Castings, Limited): (1) "Use of Ethyl Silicate as a Binder for Refractory Materials," by J. I. Evans (Monsanto Chemicals, Limited). (2) "Laboratory Control of Investment Refractories," by J. Mitten (D. Napier & Sons, Limited). The chairman of the Association will then close the conference.

Notes from the Branches

Northampton Section

Mr. C. W. Hicks, foundry technical assistant at Rolls-Royce, Limited, Derby, presented a paper entitled the "Manufacture of Aircraft-engine Castings," to the Northampton section of the Institute of British Foundrymen at their February meeting at Wellingborough. The meeting was well attended, members being particularly interested in the paper since it was the first on non-ferrous work to be presented to the section in its four years of existence.

Mr. Hicks commenced by describing the making of a gas-turbine-engine support-ring in acicular cast iron. This casting, he said, weighed 155 lb. and was made in a dry-sand mould on a Sandslinger using conventional oil-sand cores which were scraped and jigged into position in the mould. The percentage metal composition was as follows: T.C. 2.8 to 3.5; Si. 1.7 to 2.4; Cr. 0.20 to 0.4; Mo. 0.90 to 1.3 and Ni. 1.60 to 2.0. This composition gave a tensile strength on the test-bars after a low-temperature heat-treatment of five hours at 350 deg. C. of 24 to 26 tons per sq. in.

To ensure that the casting, a major component of a jet engine, was completely sound and free from defect it was subjected to X-ray examination, ground all over, and finally checked with an oil-and-chalk test to make sure it was free from cracks. Section thicknesses in this type of casting vary from 0.125 to 0.40 in. and a tolerance of only ± 0.025 in. is allowed. The lecturer pointed out that this was extremely difficult to maintain, but he said, whilst an undersize casting had to be scrapped, one that was oversize could generally be ground down to size, and this was a factor which could be used to advantage in the foundry. He went on to say that the yield on this particular casting was 55.5 per cent., which some founders might think was low, but in actual fact it was surprisingly good considering the difficult shape and high standard of inspection imposed. He then spoke about a nozzle-box also made in acicular iron. This he said weighed 140 lb. and was of an even more difficult shape than the support-ring. It was run and fed by a system at least as complex as the job itself, and the method was no doubt developed by the well-proven process of trial and error. The yield in this case was only 32 per cent., but again high inspection standards had to be taken into consideration.

Outlet Casing

An aluminium-alloy outlet casing was the next job described, this being again for a jet engine and weighing 150 lb. as cast, but reduced to 75 lb. when fettled, giving a yield of 50 per cent. The mould was rammed by hand because the large number of chills in the job would almost certainly get out of place if machine moulded: the running and feeding method was similar to the previous examples described. Mr. Hicks placed considerable importance on casting temperature and said he checked each ladle with an immersion pyrometer immediately prior to casting, the allowance being only +5 deg. on a desired temperature of 745 deg. C. for the alloy used. After sawing off runners and feeders the casting was heat-treated and subjected to a series of caustic and acid baths—the caustic removed a small amount of surface metal, loosened core sand and opened up cracks and porous areas, whilst the acid removed the slight film of copper on the surface. In this case, also, the casting was ground all over to reveal any hidden surface-defects, oil-and-chalk tested and X-rayed to ensure the best possible results.

Finally, the production of a cascade elbow in mag-

Notes from the Branches

nesium-alloy was dealt with and the difficulties of casting with magnesium were outlined. This comparatively small casting was machine moulded and three aluminium blades were rammed up in the corebox and cast in. To prevent the liquid magnesium taking fire the mould and core-making sands had to be mixed with an inhibitor such as sulphur. Mr. Hicks explained that, for this same purpose, large moulds for magnesium castings often have to be filled with sulphur dioxide before pouring. Very heavy feeders were provided on this job the yield being once more only 50 per cent. Again there was surface grinding and oil-and-chalk testing, together with X-ray examination. In this example, however, a further treatment involving dipping in sodium metasilicate solution, followed by 15 min. in boiling dichromate, followed by lanolin and white spirit, was explained as necessary to combat corrosion in storage once the cast skin had been removed.

The paper was very much appreciated by all present, and a hearty vote of thanks to Mr. Hicks was proposed by Mr. H. Edge and seconded by Mr. K. W. Gennis after a long and informative question-time.

Slough Section

"Mechanical Aids to the Manufacture of Shell Moulds and Cores" was the title of a lecture given by Mr. D. H. Scott of E. Green & Son, Limited, to the Slough section last month. The meeting was held in the Lecture Theatre of High Duty Alloys, Limited, Slough, with Mr. P. Hoesli in the chair. Mr. Scott was accompanied by Mr. Gough who ably assisted him during the lecture.

The author commenced by showing a film illustrating the efforts made at his foundry to mechanize the many operations required to produce a shell-mould or shell-core, and it was evident that much ingenuity and thought had gone into the design and manufacture of these machines. (It should be mentioned that Mr. Gough, who accompanied Mr. Scott, was the man responsible for the design of many of the machines shown). After the film a number of coloured slides were shown; these gave greater details of the machines and of the more up-to-the-minute modifications which had been made. Coreblowing machines which were fully automatic and automatic shell-moulding machines were shown. One slide was of a core-blowing set up capable of making cores at the rate of 400 per hour, for this six coreboxes were needed, the finished cores being automatically taken away by means of a belt conveyor. The majority of the cores shown on these automatic set-ups were round; they were blown from the bottom, and no taper was required to remove them from their boxes, as this was facilitated by an air-operated plunger. Mr. Scott said that there were many problems to be overcome before an automatic machine would be capable of producing cores from a split box. Work on the design of such a machine was proceeding, however, and he had little doubt that, before long one would be produced—as yet the effort had not been 100 per cent. successful.

Mr. Scott then mentioned some experiments that had been carried out to find the maximum length of core that his foundry could blow and also the limit of sand that could be handled. These had shown that it was possible to blow cores 10-ft. long. Illustrations were shown of the making of a core 5 ft. 8 in. long and weighing 24 lb. (the same core in oil sand weighs 56 lb.). Once the corebox is at the correct temperature it is possible to produce this particular core in three minutes.

Slides were shown of the pre-coating plant at the foundry, which Mr. Scott stated had been installed after a considerable amount of research work on pre-coating sands. Using both hot and cold processes, he had found that in using the cold process there were tremendous advantages to gain, the only disadvantage as far as he could see was the risk of fire hazard. He explained that whereas in the hot pre-coating, temperature is most vital, temperature on the cold pre-coating was not as essential. In producing his own pre-coated sand, local sand deposits could be used thereby reducing the cost of the mixture, and alterations to the resin additions could easily be made; reclaimed sand could also be used to advantage.

After the lecture a very animated discussion followed, members being very eager to continue to benefit from Mr. Scott's bountiful knowledge of this interesting subject. Judging by this discussion the author's journey from Wakefield was well worth the effort.

The evening concluded by a hearty vote of thanks to Mr. Scott, proposed by Mr. H. J. Proffitt and seconded by Mr. J. P. Jones both of whom were loud in their praises for the quality of Mr. Scott's excellent colour slides. Thanks were also recorded to Mr. Gough for his assistance during the evening.

Law Cases

Furnaceman Loses Action

Dismissing a claim for £100 damages by a furnaceman whose clothing was set on fire when he was splashed by molten metal while emptying a furnace, Judge A. J. Flint at Mansfield County Court said that he was satisfied that the firm's method of sealing the furnace was a proper and modern one.

Mr. Thomas David Moore, who sued Stokes Castings, Limited, Mansfield (Notts), said he had drawn off metal from a front hole in a furnace earlier in the day and replugged the hole with a bott. Just before the end of the day's work he went to another hole to draw off the last of the metal. The bott became dislodged and molten metal went on to his clothing. He alleged the weight of the iron and slag in the furnace pushed the bott out of position.

Called for the company, Mr. Frederick Place, senior technician with a firm of foundry consultants, said he thought the accident was caused by the bott being incorrectly fitted into the hole in the first place.

The judge commented: "Moore looks on himself as a skilled furnaceman and the foreman regards him as reasonably competent. He has failed to satisfy me that any of the matters he complains of caused the bott to come out."

Machine Severed Finger

At Sussex Assizes Mr. Justice Finnemore awarded damages of £612 to Mr. Thomas Moffat Hultquist, for injuries received in an accident at the Crawley works of the Universal Pattern & Precision Engineering Company, Limited.

For the plaintiff, Mr. Martin Jukes said that about three weeks before the accident the company installed a new German machine and Mr. Hultquist, a toolroom miller, was put to work on it. While doing so part of the machine swung round and Mr. Hultquist's finger was almost severed. It later had to be amputated.

Guards had now been fitted to the machine.

Iron and Steel Institute

Changes on Council

Changes on the Council of the Iron and Steel Institute will take effect at the annual general meeting on May 6. Mr. William Barr, who has been honorary treasurer of the Institute since 1953, will succeed Mr. C. R. Wheeler as president. Details of other changes on the Council, and the election of Mr. A. H. Ingen-Housz as an honorary member are announced.

The Institute's new honorary treasurer will be Sir Julian Pode, managing director of the Steel Company of Wales, Limited, and a director of Guest, Keen & Nettlefolds, Limited, and other companies. Mr. B. Chetwynd Talbot, chairman and managing director of the South Durham Steel & Iron Company, Limited, and Mr. C. H. T. Williams, managing director of the Park Gate Iron & Steel Company, Limited, are the new vice-presidents of the Institute.

Other changes on the Council are the election of Major W. R. Brown, chairman of Ashmore, Benson, Pease & Company, and Mr. T. R. Craig, a director of Colvilles, Limited, as ordinary members of the Council, and of Dr. N. P. Allen, F.R.S., director of the metallurgy division of the National Physical Laboratory, and Mr. Albert Jackson, technical adviser on steel-making to the United Steel Companies, Limited, as additional honorary members of the Council.

ISHRA disposes of Darwin & Mostyn Iron

It was announced last week by the Iron and Steel Holding and Realization Agency that the sale has been completed to Close Bros., Limited, and Cyril Kieft & Company, Limited, acting jointly as agents for the Barrow Hæmatite Steel Company, Limited, of the capital of the Darwen & Mostyn Iron Company, Limited, Mostyn (Flintshire), together with a loan of £200,000 owed by that company to ISHRA.

Out of the total purchase price of £1,260,000, the sum of £1,060,000 has been paid to the agency. The purchasers have undertaken to pay the balance of £200,000 with interest not later than September 30, 1960. The book value of ISHRA investment in Darwen & Mostyn Iron was £692,000. This was made up of £492,000 compensation for the issued share capital under the 1949 Nationalization Act, plus £200,000 which was the outstanding balance of loans by the agency at March 30 this year. Over 90 per cent. of the issued ordinary shares in Barrow Hæmatite was acquired in February by Arusha Industries, Limited.

Continental Foundry Pig-iron Prices

Several of West Germany's minor producers of foundry pig-iron have increased the rebate on this from DM 42.50 (about £3 11s. 6d.) per ton to DM 62.50 (about £5 5s.) per ton in an attempt to combat the strong non-ECSC foreign competition in the product. Italian ferro-manganese producers have lowered their prices by 14 per cent. for similar reasons.

Increases in price are reported, however, from Belgium, where the Boel concern has raised certain steel prices by 12 per cent., and from Holland, where Demka Staalfabrieken have increased some prices by 7 per cent.

Equipment and Supplies

Radiation Shielding

David Brown Industries, Limited, have acquired exclusive manufacturing rights in Britain of a patent form of radiation shielding, perfected in America by Knapp Mills Incorporated, of New York. Claimed to provide the most efficient form of shielding against radiation yet devised, the process has extensive application in the chemical processing industry. It has been found eminently suitable for use where highly-corrosive liquids or chemicals need to be contained, or where radio-active corrosives must be processed and shielded. Manufacture of the shielding will be carried out at the David Brown Jackson Division, Salford, Lancashire in the former steel foundry.

Magnetic Lifting and Automation

Rapid Magnetic Machines, Limited, Lombard Street, Birmingham, have introduced a new model, the "Midget," into their range of electro-magnets (see Fig. 1). It is suitable either for lifting and transporting or for holding, and may be attached to hoist hooks, manipulating arms, loading jigs or other devices. For most applications only one magnet is needed, but in instances where long lengths or unusual shapes are involved two or more magnets may be used. Advantages claimed are simplicity of operation; lack of moving parts and consequent maintenance problems; adaptability to remote and automatic control, and lessening of physical strain on loading personnel. With the inclusion of the "Midget" the company's range now covers lifting magnets from 2 to 76-in. dia., weighing from a few oz. to 6 tons.

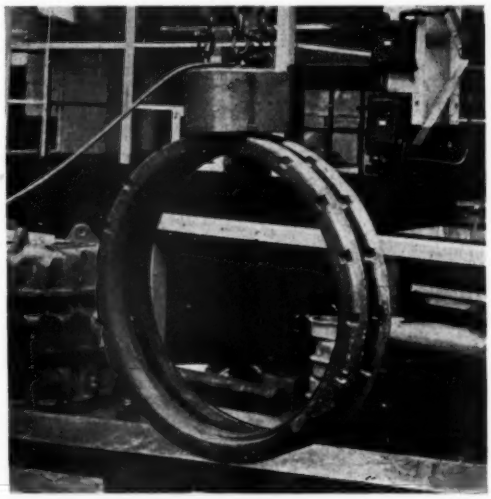

FIG. 1.—*"Midget" electro-magnet, which is now being marketed by Rapid Magnetic Machines, Limited, of Birmingham. It is shown here lifting a ring casting.*

Company News

A.B.C. COUPLER & ENGINEERING COMPANY, LIMITED—The company is not going to proceed with its intended offer for the ordinary share capital of General Stockholders Investment Trust.

G. & J. WEIR HOLDINGS, LIMITED, engineers and foundrymen, Glasgow—Group net profits increased from £1,028,131 to £1,162,263 in 1958, and the dividend is raised 1 per cent. to 17 per cent. with a 13 per cent. final.

JAMES H. LAMONT & COMPANY, LIMITED, engineers and brassfounders, of Edinburgh—The dividend is being raised from 25 per cent. to 30 per cent. for 1958 with a final of 25 (20) per cent. The net profit is £48,638 (£34,199).

JAMES BOOTH & COMPANY, LIMITED, non-ferrous metal manufacturers, etc., of Birmingham (a subsidiary of the Delta Metal Company, Limited)—There is no dividend on the ordinary shares for 1958, against 9 per cent. in 1957. Group net profit was £104,143 (£141,417).

SANBRA, LIMITED, manufacturers of sanitary brassfoundry, non-ferrous castings, etc., of Birmingham (controlled by the Delta Metal Company, Limited)—Dividend of 15 per cent. for 1958 (13¾ per cent.). Group profit is £228,143 (£79,599) before tax of £114,354 (£27,325).

GLOVER & MAIN, LIMITED, gas engineers, of London, S.W.1—In addition to maintaining its dividend at 1s. per 10s. share for 1958 with an unchanged final of 10d. per share, the company is paying a special interim of 4d. per share in respect of 1959. Group net profit is £280,427 (£195,536).

HARRISON (BIRMINGHAM), LIMITED, brassfounders, metal rollers, etc.—A dividend of 9d. and a bonus of 1½d., both tax free, per 5s. share for 1958, is to be paid, against a dividend of 7½d. and a bonus of 1½d. for 1957. The 1958 bonus is to be regarded as arising from the improved profits. Group profits rose from £82,813 to £123,321.

F. PERKINS, LIMITED, diesel engine manufacturers, of Peterborough (Northants)—The company, which is a subsidiary of Massey-Ferguson Holdings, Limited, reports a group net profit of £375,265 for 1958, against a loss of £310,236, after a tax charge of £120,377 (credit £8,727). No dividend is recommended on the £2,600,000 capital. Last payment was 10 per cent. for 1956.

JOHN BROWN & COMPANY, LIMITED—The company announces that in respect of its rights offer of 1,311,658 ordinary £1 shares each at 30s. per share, acceptances totalled 1,236,028 (94 per cent.). Applications for excess shares amounted to 561,285 against the available balance of 75,630. Applicants for up to 40 shares have received allotment in full; other applicants have each been allotted 40 shares.

WOLVERHAMPTON DIE CASTING COMPANY, LIMITED—As holders of the 7 per cent. convertible unsecured loan stock will shortly become entitled to convert into ordinary shares, it has been decided, in order to bring interest and dividend payments into line, that interim ordinary dividends will be payable on June 30 and the final dividends on December 31 each year. A meeting, to consider the interim in respect of the year to June 30, 1959, will be held on April 30.

CROFTS ENGINEERS (HOLDINGS), LIMITED—The dividend total on the existing £2,000,000 ordinary capital is being effectively raised by 2½ per cent. to 17½ per cent., and it is proposed to make a one-for-four free scrip issue. The payment for 1958 is held at 15 per cent. with an unchanged 8¾ per cent. final, but a first interim of 2½ per cent. is declared for the current year, payable with the 1958 final. Profit for 1958 of £1,290,556 compares with the previous year's £1,369,646.

IMPERIAL CHEMICAL INDUSTRIES, LIMITED—A final dividend of 5½ per cent. makes 8 per cent. for 1958. This is the same as the 1957 payment of 12 per cent., after adjusting for the one-for-two scrip issue. Group sales were unchanged at £463,000,000, but income, before tax, contracted from £55,100,000 to £44,500,000 after an extra £5,100,000 for depreciation. Deducting £20,700,000 (£26,300,000) for tax, the net profit is nearly £5,000,000 down at £23,850,000 (£28,810,000). There is £21,700,000 (£26,800,000) applicable to the parent.

POLLARD BALL & ROLLER BEARING COMPANY, LIMITED (formerly Ferrybridge Industries, Limited)—The company is paying a final dividend of 17½ per cent., making 22½ per cent. for 1958 on £435,174 ordinary as increased by a one-for-six rights issue. A single payment of 20 per cent. was paid for 1957 on the smaller capital. It is also proposed to capitalize part of share premiums for a one-for-four scrip issue. Group profit, before tax, is £371,121 (£250,361), including a full year's profit of Pollard Bearings (Northampton), Limited.

ASQUITH MACHINE TOOL CORPORATION, LIMITED—Mr. Robert W. Asquith, the chairman, has assured employees of Kitchen & Wade, Limited, manufacturers of drilling, boring, and honing machines, of Halifax (Yorks), that there is no intention of altering their conditions of service. If, as a result of the merger, new promotions are found necessary, they will naturally be considered. He adds that negotiations are now being carried on which, if successful, and given normal business conditions, should result in a strain on the production resources of both the Asquith and the Kitchen & Wade manufacturing organizations.

New Patents

(Copies of complete specifications are obtainable from the Patent Office, Sales Branch, 25, Southampton Buildings, Chancery Lane, London, W.C.2, price 3s.)

804,949. Pontardawe Foundry and Engineering Company, Limited, Holly Road, Pontardawe, Swansea, Glamorganshire, South Wales.

An improved ingot-mould stopper in the form of a cast-iron lid or cover. One or more steel or re-inforcing rods are incorporated into the cover while it is being cast.

805,052. Société Pour L'Exploitation de Procédes Nouveaux Metallurgiques, 3 rue J. B. Charcot, Courbevoie (Seine), France.

Coatings for steel and cast-iron moulds. The purpose of these castings is to provide either a physical insulation between the walls of the mould and the liquid steel, or a chemical action on the metal or slag inclusions associated therewith along these walls, and sometimes to obtain both these effects. (See also Patent No. 707,675.)

805,282. Rolls-Royce, Limited, Nightingale Road, Derby.

The preparation of moulds for the precision casting of metals. This patent is primarily concerned with processes such as the lost-wax process or where the moulds are formed around an expendable pattern made of a metal of relatively-low melting point, *e.g.*, a tin-bismuth alloy. (See also Patent No. 731,445, FOUNDRY TRADE JOURNAL, July 21, 1955.)

News in Brief

HADFIELDS, LIMITED, Sheffield, have returned to a five-day week in their steel foundry after some months on a four-day week.

THE NEXT CONGRESS of the *Bureau International de la Récupération* is to be held at Scheveningen from May 13 to 15.

ON AND AFTER April 20 the address of the Combustion Engineering Association will be 70, Jermyn Street, London, S.W.1 (telephone: WHITEHALL 5536).

INSOLA, LIMITED, southern agent for Haywood Bros., patternmakers, of Littleborough, announce that their address is now 20, Grosvenor Place, London, S.W.1. ('Phone: SLOANE 1800.)

A COMPREHENSIVE RANGE of compressed-air equipment will be shown by Atlas Copco (Great Britain), Limited, at the Hanover Trade Fair, Europe's largest industrial exhibition, from April 26 to May 5.

WILKINS & MITCHELL, LIMITED, manufacturers of machine tools, washing machines, etc., of Darlaston, Wednesbury (Staffs), has bought the Wednesbury factory formerly owned by W. P. Edmonds, Limited.

AN ORDER for two vehicle ferry ships, worth about £1,600,000, that will make it one of the busiest small yards in Scotland has been placed with the Ailsa Shipbuilding Company, Limited, Troon (Ayrshire), by the Atlantic Steam Navigation Company.

PRESENTATION OF GOLD WATCHES recently to 135 employees of the Stanton Ironworks Company, Limited, Ashbourne (Derbyshire), brought the number of watches presented by the company for long service to 1,936. Workers with 30 years' service qualify for the award.

RUSTON & HORNSBY, LIMITED, engineers, Lincoln, have secured two more large contracts for the Middle East worth together £400,000. They are for diesel engines and pumps for Syria and Saudi Arabia. The engines will be used mainly for irrigation schemes and for powering agricultural and industrial machinery.

WORKERS IN THE FOUNDRIES of Glenfield & Kennedy, Limited, Kilmarnock, have been informed that because of trade recession it will be necessary to lay some of them off for one week in every five. About 150 men are likely to be laid off this week. The position will be reviewed from week to week. The foundries have been on a four-day week since last June.

THE YORKSHIRE SECTION of the Society of Instrument Technology, held its annual dinner in Sheffield on March 24. Speakers included Dr. Charles Sykes, managing director of Thomas Firth and John Brown, Limited, Sheffield, Mr. J. F. Coates, president of the Society, and Mr. H. C. Pritchard, director of the Cambridge Instrument Company, Limited.

A CONFERENCE on "Modern Methods of Analysis for Cast Iron" is being organized by the British Cast Iron Research Association. It is to be held on Monday and Tuesday, June 22 and 23 at the Royal Commonwealth Society, London, W.C.2. Details are available from Mr. G. R. Woodward, manager, intelligence department, at Bordesley Hall, Birmingham.

ROTARY HOES, LIMITED, West Horndon (Essex), has signed a contract to supply Howard rotavators and service parts to Yugoslavia during 1959 valued at nearly £250,000. The order has been placed by Industrija Traktora i Masina, of Belgrade. The West Horndon company is shortly to export to Belgrade the first of its 6-ft. Howard soil stabilizing trains to be used for roadmaking.

DUE TO EXPIRATION of the lease and early demolition of the property at 5, Victoria Street, London, S.W.1, the registered office of the Cronite Foundry Company, Limited, is now at Portland House, 73, Basinghall Street, London, E.C.2. The transfer department will operate from the company's head office at Lawrence Road, Tottenham, London, N.15 (telephone: STAMFORD HILL 4237).

THE CENTRO METALLURGIA NUCLEARE DELL' ASSOCIAZIONE ITALIANA DI METALLURGIA (the Nuclear Metallurgical Centre of the Italian Metallurgical Association) is holding a conference on May 9 at the *Sala del Cenacolo del Museo Nazionale della Scienza e della Technica* (*Via S. Vittore* 21). Details are available from the secretary *Associazione Italiana di Metallurgia*, Milan, Via Moscova, 16.

ELLIOTT-AUTOMATION, LIMITED, London, N.W.10, has formed a new subsidiary company, the Swartwout Company, Limited, to manufacture and sell the all-electronic control systems for the process industries, heating and ventilating, and for power station instrumentation (both atomic and conventional) developed by the Swartwout Company of Cleveland, Ohio. Elliotts entered into an agreement with the American company two years ago.

Mr. F. G. COOKE, the manager of the engineering department of Drew Brown, Limited, of Montreal and Toronto will be in this country from May 10 to June 1. He will visit the foundry supply companies his firm represents. Other concerns interested in the export of foundry plant and supplies to Canada should write to Mr. Cooke c/o Henry Gardner & Company, Limited, 2, Metal Exchange Buildings, London, E.C.3.

SPEAR & JACKSON, LIMITED, hand-tool manufacturers, Sheffield, has been selected to display its new packaging and labelling methods at the exhibition of house styles organized by the Design and Industries Association in London. (The exhibition opened on March 31 and will close on April 18.) The firm has conducted research into its packaging with a view to the growing market for home carpentry and gardening.

THE BOARD OF TRADE have laid before Parliament rules made under the Patents Acts 1949-1957, providing for the admittance of the public to the hearing of certain Patent matters by the Comptroller General of Patents, Designs and Trade Marks. Normally in the past such hearings have been in private. In order to give the parties notice of the change in practice, the new rules will not come into opration until July 1.

ON BEING ASKED for an assurance that the proposed £54,000 trades college for Arbroath would cater for apprentices in the building trade as well as for those in engineering, Mr. R. A. Stuart said, at a meeting of the Arbroath and District Education Committee, that the intention was to use the college for boys in the county. Engineering had been a big factor in the proposal to build such a college, but there was no intention of excluding other apprentices.

SHELL-MEX AND B.P., LIMITED, have advised Lord Glentoran, Northern Ireland Minister of Commerce, that their parent companies are in principle willing to construct and operate a refinery in Northern Ireland subject to satisfactory conditions being negotiated with his Ministry and other interested parties. Lord Glentoran is reported to have said that the location will depend on more detailed investigations, but Londonderry will be given the closest consideration as a possible site.

THE FINAL CAST of 25 tons of pig-iron was made on March 27 at the blast furnace of the Lilleshall Iron &

News in Brief

Steel Company at St. Georges, near Oakengates, Shropshire. It had been working night and day for the past two-and-a-half years. The first furnace in Salop was built in 1560 at Morville, and the Lilleshall one was the last in the county. Mr. E. Bruce Ball, managing director of the company, said that it was intended to clear the site and use it for some other enterprises of the company.

Mr. CHARLES BRIGGS, who was the last man to have worked at the ancient Shepherd Wheel in Whiteley Wood, Sheffield, is advising Sheffield Antiquities Council on its restoration. An agreement between Sheffield Corporation and the Council for the Conservation of Sheffield Antiquities provides for the repair of the wheel, and its inspection by the public. Mr. Briggs, who is now 74, worked as a grinder for nearly 40 years from 1899 at Shepherd Wheel. Most of the machinery in one of the two hulls was made by himself or his father or brother.

A FIVE-DAY RESIDENTIAL COURSE, designed to equip employees to instruct their colleagues in kinetic methods of manual lifting and handling, has been organized by the Industrial Welfare Society, in association with the Central Council of Physical Recreation, and will be held at Victoria Court, Eastbourne, from April 20 to 24. The inclusive fee for the course is £15 15s. for delegates from IWS member organizations and £16 16s. for those from non-members. (It is surprising that such a lengthy course should be deemed necessary for instruction in such a limited field: Editor.)

WORK HAS STARTED on the site of the former Kirkcaldy High School as the first phase in connection with a new £700,000 technical college to accommodate 3,000 students. It will be the largest building project Fife Education Committee have yet undertaken, and the three-phase building programme aims at completing the premises within five years. The college will provide technical training for every industry in the area. Engineering and mining laboratories will be provided in the quadrangle of the present technical college, but the main feature of the development will be the provision of an eight-storey block of classrooms and workshops on the site of the former High School.

HALIFAX HEALTH COMMITTEE has decided not to make any variation to the Halifax Smoke Control Order providing for the exemption of underfeed stokers, but has recommended that the Minister of Housing and Local Government be urged to make an early decision with regard to the general exemption of the appropriate types of underfeed stokers from the Clean Air Act of 1956. At the last monthly meeting of Halifax Town Council it was agreed to refer back the decision of the Committee, declining a request for an interview by the Yorkshire Regional sales manager of the National Coal Board to discuss the exemption of underfeed stokers from the Act.

DURING RECENT MONTHS Midland scrap-metal merchants have been relieved of an embarrassing situation by a Government decision to allow the export of scrap, it was stated in the report presented at the annual meeting, on March 26, of the Midland Scrap Iron Steel and Metals Association. It was also reported that 1958 had proved a trying year for members because of the lack of demand for all types of ferrous scrap, and "this situation had caused accumulation of stocks at scrap yards to such a serious extent that approaches were made to the Ministry of Power to allow a certain degree of exporting." Subsequent to licences being granted, shipments started in the last quarter of the year, and had continued steadily.

AT THE ANNUAL GENERAL MEETING of the Non-Ferrous Club held recently, Mr. W. H. Demel was again elected president. The five members of committee are as follow: Mr. R. L. Deutsch (Deutsch & Brenner, Limited); Mr. R. J. Freeman (A. D. Keeling & Company, Limited); Mr. Hugo McGhee (Hugo McGhee (Metals), Limited); Mr. P. Mould (Mould Bros. (Camp Hill), Limited), and Mr. W. H. Vizor (Deutsch & Brenner, Limited). At the first meeting of this committee on April 1, the following appointments were approved: as chairman, Mr. W. H. Vizor; as secretary, Mr. M. L. B. Wright; as treasurer, Mr. A. E. Teasdale (Martins Bank, Limited), and as Press officer, Mr. G. E. Lewis.

SPEAKING at the annual luncheon in Birmingham, on March 24, of the Midland branch of the National Union of Manufacturers, Mr. Morton Oliphant, president of the NUM urged counter attacks on threats of more nationalization. He said a promise hade been made that nationalized industries would pay their way and earn their keep, but the figures given concerning them were a "snare and a delusion" because depreciation had been allowed only at historic rather than current replacement costs. In the first nine years the Boards in aggregate had set aside some £1,250,000,000 to replace assets but on current costs the figure should have been nearly £2,250,000,000. It had also been promised that nationalized industries would be efficient, but the only method of testing efficiency was the commercial system where success or failure was shown in the annual accounts. If a nationalized industry sold its wares below costs it was the taxpayer who made up the difference not the consumer.

Presentations to the Master Cutler

The Master Cutler, Mr. J. Hugh Neill, was presented with a silver model of the famous racehorse, Eclipse, by members of the staff of James Neill & Company (Sheffield), Limited—of which he is deputy chairman and joint managing director—on April 2. The gift was to mark his year of office and 2,500 employees of the firm contributed, Eclipse is the firm's trade mark, and the race horse, foaled in 1724, never lost a race.

The presentation was made at the Cutlers' Hall by Miss M. Beer and Miss C. Biggin, employees of the firm. A bone-china coffee set was given to the Mistress Cutler. A framed illuminated address on vellum was also given to the Master Cutler, to hang with similar addresses presented to his father, Sir Frederick Neill, the firm's chairman and joint managing director, and the late Mr. James Neill, founder of the company, during the time they held office as Master Cutler, to mark the close association of the family with the Cutlers' Company.

Two Calendars. The receipt last week at the JOURNAL office of two calendars is gratefully acknowledged. The first, a very colourful one, came from the Allis Chalmers concern of Wisconsin and is of the very useful type comprising 12 sheets each of which carries the days of the current month in large type and the preceding and following month in smaller type. The second is Eyre Smelting Company, Limited's "Sporting Calendar," always issued at about this time of year (and beginning at the month of April). In addition to the bi-monthly sheets exhibiting pictures of sporting activities, there is attached at the back a diary of the principal UK sporting events from April to December this year.

Obituary

Mr. W. KILLINGBECK, chairman and managing director of Barrow Ironworks, Limited, Barrow-in-Furness (Lancs), died in London, March 25. He was 67.

The death occurred on March 26 of Mr. DUNCAN WALKER who for many years, prior to his retirement in 1949, was works manager of Mitchell, Russell's Chattan Foundry, Bonnybridge, Stirlingshire. He was 72.

The death has taken place suddenly at his home at Jesmond, Newcastle-upon-Tyne, of Mr. SHERWOOD HUNTER, managing director of Joseph Cook, Sons & Company (1930), Limited, engineers, steel and iron founders, of Washington (Co. Durham).

The death occurred suddenly on March 24 of Mr. CLIFFORD BRIERLEY, export sales manager of Platt Brothers & Company, Limited, textile-machinery manufacturers, Oldham. Aged 42, Mr. Brierley had been with the company for many years and was formerly manager of one of the company's agencies in Brazil.

Mr. ERNEST TAYLOR, who retired eight years ago from his position as chief electrical engineer of the Sheepbridge Company, Limited, iron and steel manufacturers, of Chesterfield, died last week at the age of 70. He had spent most of his career with the company and became chief electrical engineer in 1932. Mr. Taylor was a former president of the South Yorkshire Institute of Mining and Electrical Engineers.

Mr. DANIEL R. HARRISON, a former director of the Scottish Central Iron Company, has died in hospital at Stirling. Mr. Harrison, who entered the family business of the Scottish Central Iron Foundry on leaving school, was a director and cashier up to his retirement some years ago. He then became a director of William Harrison & Sons, Limited, bolt and screw manufacturers, which was founded by his father. He was 70 years of age.

Sir ASHLEY WARD, president of Thos. W. Ward, Limited, Sheffield, died on March 26 at the age of 81. Sir Ashley was also chairman of the Park Gate Iron & Steel Company, Limited, Rotherham, and vice-president of the Laycock Engineering Company, Limited, Sheffield. A nephew of Thomas W. Ward, the founder, he joined the company in 1892, being subsequently sent to London where he established the extensive Silvertown Works. In 1941 he became chairman and managing director and in 1950 he was appointed the first president of the company. He became Master Cutler in 1939, was chairman of the Sheffield National Savings Movement from 1942-49, and in 1955 Sheffield University conferred on him the degree of Doctor of Law in recognition of his work for education. He was knighted in February 1958.

Board Changes

BELLISS & MORCOM, LIMITED—Mr. R. F. Batty has been elected to the board and appointed chairman.

WESTINGHOUSE BRAKE & SIGNAL COMPANY, LIMITED—Mr. G. W. Dunkley has been appointed a director.

BARROW HÆMATITE STEEL COMPANY, LIMITED—Mr. Cyril W. Kieft has been appointed an additional director.

BAKELITE, LIMITED—Mr. C. A. Robb, control manager, has been appointed a director of the company. Mr. B. T. Burgoyne, of the US, has been appointed to the board in place of Mr. Alex MacKenzie, also of the US, who has retired.

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Engineering, Marine, Welding and Nuclear Energy Exhibition

*The Engineering, Marine, Welding and Nuclear Energy exhibition is to be held from April 16 to 30 at Olympia, London. From amongst this very large number of stands a few, having exhibits of interest to foundrymen, are reviewed below.**

AUDLEY ENGINEERING COMPANY, LIMITED (*7P, Ground, National*), will exhibit the new Audco-Annin control valve which has been developed for controlling all kinds of liquids.

C. A. PARSONS & COMPANY, LIMITED (*5E, Ground, Grand*). The main exhibit will be a model of the new 550-mw. turbo-generator, claimed to be the largest in the world, ordered by the C.E.G.B. for the Thorpe Marsh power-station.

BRITISH ROTOTHERM COMPANY, LIMITED (*14 Inner, Gallery, Grand*), will be exhibiting a comprehensive range of dial thermometers, recorders and controllers.

METAL AND PIPELINE ENDURANCE, LIMITED (*3 Centre, Gallery, National*), are introducing a range of pile-driven magnesium anodes for cathodic protection.

W. C. HOLMES & COMPANY, LIMITED (*6DD, First, Empire*), will display the Holmes-Rothemuhle multi-cell cyclone dust-collector which is designed to minimize stack emissions from hand-, stoker-, and pulverized-fuel-fired boilers.

W. H. ALLEN, SONS & COMPANY, LIMITED (*1D, Ground, Grand*), will show a wide range of power-generating plant, including the Allen shaft-generator, designed to be built round the intermediate shaft of a ship.

CRANE, LIMITED (*4G, Ground, Grand*), will show a giant 16-in. cast-steel valve, weighing 1½-tons, and standing 9 ft. high.

ROBERT HARLOW & SON, LIMITED (*11AA, First, Empire*) will exhibit a recently designed range of heavy-duty fullway valves.

HILMOR, LIMITED (*6K, Ground, Grand*). New tube-bending machines will be shown for the first time.

NEW WELBECK, LIMITED (*46, Outer, Gallery, Grand*), will introduce several new industrial cleaning-machines.

TILGHMANS, LIMITED (*5Y, Ground, Empire*), will show their new Blast Seal, which is an application for surface-protection after shotblasting.

KEITH BLACKMAN, LIMITED (*1A, Ground, Grand*), will display a cross-section of the Tornado range of fan and industrial gas equipment, and will also cover equipment relative to clean air and dust extraction.

CONSOLIDATED PNEUMATIC TOOL COMPANY, LIMITED (*6C, Ground, Grand*). The largest exhibit will be a new Class-FE balanced-opposed horizontal stationary air-compressor.

THOS. W. WARD, LIMITED (*10B, Ground, Grand*), will show Ficep shearing machinery.

ALBRIGHT & WILSON (MANUFACTURING), LIMITED (*3 Outer, Gallery, Grand*). A wide range of metal treatments will be demonstrated.

VACU-BLAST, LIMITED (*6W, Ground, Empire*). Amongst a range of mobile, dust-free shotblast machines will be the new Vacu-Blast (Major Mk. II).

CROFTS (ENGINEERS), LIMITED (*4BB, First, Empire*). Focal point of this stand will be two new types of universal-mounting gear units, and a new type of flexible coupling known as the "Croft-Ring" coupling.

IMPERIAL CHEMICAL INDUSTRIES, LIMITED, Billingham Division (*6, National*). Sodium silicate, carbon dioxide, and isopropyl alcohol will be featured on a stand showing the advantages that the CO_2 Process has over conventional foundry practice in the production of moulds and cores.

A.P.V.-PARAMOUNT, LIMITED (*12K, Ground, Grand*), are exhibiting castings in their range of "Paralloy" stainless, heat-resisting, carbon and special-alloy steels.

CARTER GEARS, LIMITED (*10AA, First, Empire*). A new demonstration unit will show the versatility of the Carter variable-speed gear, particularly with regard to cyclic speed-changes.

AIR CONTROL INSTALLATIONS, LIMITED (*27 Outer, Gallery, Grand*). Dust-control and air-filter equipment, and a range of small blowers, will be demonstrated.

* The three symbols or words in the brackets after each firm's name indicate Stand No., Floor, and Hall, respectively.

Brown Bayley, and Hoffman, Dividends

Holding company, Brown Bayley, Limited, formed to acquire the undertaking of Brown Bayley's Steel Works, is raising its final dividend by 1 per cent. to 8¾ per cent., making 11 (10) per cent. for the year. Group profits of £160,264 (£151,842) include dividends from the Hoffmann Manufacturing Company, Limited, group and Brown Bayley Steels, Limited, group.

The 1958 figures include a complete year's dividends from both groups—the comparative figures for the previous period (15 months) include a whole year's dividends by Hoffmann and for a 15 months' period by Brown Bayley Steels.

A final dividend of 8 per cent. is being paid by Brown Bayley Steels, Limited, making 11 per cent. for 1958, an annual rate equivalent to the 13¾ per cent. paid for the previous 15 months' period. Group profit after tax is £328,959 (£472,669).

The Hoffmann Manufacturing Company, Limited, manufacturers of steel balls, roller bearings, etc., of Chelmsford (Essex), is paying a 60th anniversary cash bonus of 5 per cent., with its final dividend of 24½ per cent. for 1958, making 36 per cent., less tax. A total dividend of 17½ per cent. tax free was paid for 1957.

Group profits have declined from £1,291,746 to £1,206,476, and net profits are lower at £652,002 (£647,026). Subsidiaries retain £109,584 (£135,110), and parent's profit is £515,418 (£511,916).

Stone-Platt Link with America

Formation of a new company, Carlyle Air Conditioning & Refrigeration, Limited, is jointly announced by Mr. Kenneth Preston, chairman of Stone-Platt Industries, Limited, and Mr. Cloud Wampler, chairman of the Carrier Corporation, Syracuse, New York, US. The same interests have also acquired the whole of the share capital of the Winsor Engineering Company, Limited, Glasgow, which for many years has specialized in the installation of air-conditioning, ventilating, and refrigeration systems on shipboard.

Head offices of the Carlyle Air Conditioning & Refrigeration, Limited, will be in London. Mr. Ralph S. Reynolds, formerly in charge of the business of Carrier International in South Africa, has been designated managing director.

Festival of Films in the Service of Industry

At Harrogate, on April 21, the Second Festival of Films in the Service of Industry will be opened at 8.45 p.m. by the Rt. Hon. Viscount Chandos, with the President, Lord Godber, presiding. The festival will last until April 24, when the awards will be presented at a dinner, the principal guest speaker being Viscount Monckton, chairman of the Midland Bank. Those wishing to attend the festival should write to The Secretary, 3, Portman Chambers, 7/9, Baker Street, London.

Cutting costs in the foundry

Versatile Yale trucks save labour, cut production time, prevent damage

In British foundries, Yale trucks help to avoid unnecessary handling, free men for more productive work, cut production time and costs. Here are three examples of Yale *planned handling* at work:

PREVENTING DAMAGE...

The versatile Yale Series 51 truck is used in all foundry departments by K & L Steel Founders & Engineers Ltd. of Letchworth. It is seen here transporting 12 carbon electrodes weighing some 3,900 lbs from the foundry stores to the steel melting shop. By placing these brittle electrodes on stillages, and moving them with the Series 51 truck, damage has been virtually eliminated.

Yale Series 51 electric trucks are available in capacities from 3,000 lbs to 10,000 lbs.

SAVING LABOUR...

This Yale Worksaver saves time and labour at the Leeds foundry of Catton & Co. Ltd. Here it is seen loading a full ladle on to a bogie for movement to the moulding shops. The 10-ton bogie is pulled by the Worksaver, driven by the ladle man. Drivers of trucks previously used to haul the ladle have been released for more productive work in the foundry. The Worksaver also helps to speed deliveries of steel to all moulding shops.

Yale Worksavers are available in Platform and Pallet Models (2 or 3 tons); Fork Lift (1,500, 2,000, 2,500, 3,000 lbs); Tractor (700 lbs draw-bar pull).

...SAVING TIME AND COSTS

At the Holfos foundry of John Holroyd & Co. Ltd., the old practice of searching through a pile of heavy chills to find the right one for a particular job was dispensed with by building a special store. Although this store is only 85' by 25' in area, it accommodates some 5,000 chills. Chills are housed in 370 compartments, on 5-tiered racks. Each is easily identified, and is moved on a pallet by a Yale Warehouser fork truck, which can work in aisles only 6 feet wide. Heavy manhandling no longer adds to time and production costs.

Yale Warehousers are available in Platform Models (2 tons); Fork Lift Models (2,000 and 3,000 lbs).

The Yale range includes power trucks for every lifting and moving need up to 200,000 lbs; Hand Trucks for loads up to 12,000 lbs; Hoists for lifting up to 40 tons (trolleys to suit all models); Pul-Lifts in capacities from ½ to 15 tons.

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The YALE & TOWNE Manufacturing Company, Materials Handling Division, Dept. FT4, Wednesfield, Staffs. Tel: Willenhall 941.

Personal

Mr. GEORGE W. DUNKLEY has been appointed a director of Westinghouse Brake & Signal Company, Limited.

Mr. A. D. R. PALMER, C.A., secretary of Nicol & Andrew, engineers, Glasgow, has been appointed a director.

Mr. C. A. HENDERSON, general manager of the Eutectic Welding Alloys Company, has been appointed managing director.

Mr. VERDON O. CUTTS, manager of the process-heating department of the General Electric Company, Limited, retired on March 31.

Mr. ALLAN RAY PUTNAM has been appointed managing director of the American Society for Metals which has a membership of 30,000.

Mr. J. F. PAIGE who, until 1957, was managing director of William Mills, Limited, Wednesbury, Staffs, has resigned from the board of the company.

Mr. L. BAILEY has been appointed a director of United Steel Structural Company, Limited, Scunthorpe, a subsidiary of the United Steel Companies, Limited.

Mr. ALAN SANDERSON has been appointed sales manager for the Blaw Knox Chemical Engineering Company, Limited, Watford, and Medway Works, Rochester.

Mr. DAVID PATRICK, of the Scottish Machine Tool Corporation, is retiring from the management of the Craigdonald works but will continue to be a director of the Corporation.

Mr. LEWIS H. DURDIN, president of the American Foundrymen's Society, will be touring Europe during the month of May. He will arrive in England on May 22 and leave on May 27.

Mr. N. Y. NEWTON, B.SC., A.I.M., formerly chief metallurgist of Catton & Company, Limited, Leeds, has been appointed works manager of Weir Foundries, Limited, Thornliebank, Glasgow.

Mr. R. N. HARDING, has joined Metal Industries, Limited, as an assistant to the company secretary. For the past 10 years he has been assistant to the secretary of Allied Ironfounders, Limited.

Mr. GORDON HEYNES has retired from the board of Modern Engineering Machine Tools, Limited, and from its subsidiary, Linley Engineering, Limited, in order to devote more time to his other business interests.

Mr. WILLIAM NEWTON has been appointed secretary of British Northrop, Limited, Blackburn. He succeeds the late Mr. T. H. TURNER. Mr. Newton, who is assistant secretary, has been with the company for over 40 years.

SIR JOHN GREEN, chairman of Thomas Firth and John Brown, Limited, William Beardmore & Company, Limited, and of the Iron and Steel Corporation, has been re-elected a part-time member of the East Midlands Gas Board.

Mr. R. W. LAMONT, deputy chairman, becomes chairman of Watson, Laidlaw & Company, Limited, engineers, Glasgow. Dr. J. P. LAIDLAW becomes deputy chairman, and Mr. G. LAMONT becomes assistant managing director.

Mr. H. V. HEATHER, for over 35 years chief buyer for the Pulsometer Engineering Company, Limited, of Reading and London, has retired after more than 57 years' service with the company. He has been succeeded by Mr. C. Moss.

Dr. J. N. ALDINGTON and Mr. K. W. MARTEN have been appointed directors of the London Electric Wire Company & Smiths, Limited. Mr. Marten will hold the executive office of sales director. Dr. Aldington is a director of Associated Electrical Industries, Limited.

Mr. WALTER TOWLER, foreman at E. Green & Son, Limited, Wakefield, has retired after 62 years' service with the firm. He has already received a presentation for 50 years' service and is now to receive another to mark his retirement. He is believed to be one of the last "bowler-hatted" foremen.

Sir STUART C. GOODWIN and Mr. J. G. WIDDOWSON have resigned their positions as chairman and managing director respectively of Neepsend Steel & Tool Corporation, Limited, but will remain on the board as active directors. Sir Stuart has been elected president of the company and Mr. Widdowson vice-president.

President of the British Compressed Air Society for 1959-60 is Mr. E. A. MARTIN (Padley & Venables, Limited). The vice-president is Mr. J. C. GREIG (Atlas Copco (Great Britain), Limited), the honorary technical director is Mr. T. C. HORE (Holman Bros., Limited), and Mr. H. S. PARSONS (Consolidated Pneumatic Tool Company, Limited), is the honorary publicity officer.

The president of the Society of Chemical Industry, Sir ROBERT ROBINSON, O.M., F.R.S., will complete his term of office at the annual general meeting of the society in Glasgow on July 10. The council has appointed M. E. J. SOLVAY, of Brussels, to succeed Sir Robert as president. M. Solvay is a direct descendant of the discoverer of the ammonia soda process which bears his name.

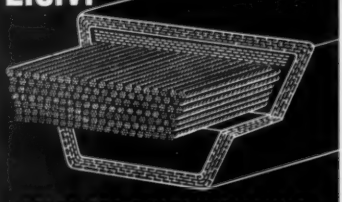
After 44 years' service with the company, Mr. R. G. HILLER, head of the sales and agency accounts section of the English Steel Corporation, Limited, of Sheffield, is to retire. Mr. Hillier, who is 65, was 21 when he joined Vickers, Limited, as factory and electrical costing clerk in 1915, after a varied training in practical building construction, engineering, and accounting in South Wales and Sheffield.

Mr. R. MIDDLETON, engineering sales manager, Newton Chambers & Company, Limited, Thorncliffe Works, Sheffield, and Mr. D. BRADLEY, chemicals engineer (development department), have returned from a visit to Prague where they discussed with Czech technologists and industrialists the plant and process for the hydro-refining of crude benzoles, for which Newton Chambers hold the world rights of manufacture.

Mr. J. E. RICHARDSON, who was for many years at the Elswick works of Vickers-Armstrongs, Limited, is to retire from the managing directorship of Canadian Vickers, Limited. He sails for England on May 1. Starting as an apprentice Mr. Richardson, who is 65, rose to become manager in charge of tank production during the last war and then deputy general manager at Barrow. For the past two years he has been assisting in the reorganization of Canadian Vickers.

Dr. GEORGE DOUGLAS STEPHEN MACLELLAN has been appointed to the Rankine Chair of Engineering (Mechanics and Mechanism) at Glasgow University. A Fellow of Pembroke College, Cambridge, since 1944, he was educated at Rugby and at Cambridge, where he obtained first class in the Mechanical Science Tripos. He was a member of the research department of Vickers-Armstrongs, Limited, Newcastle, from 1944 to 1946, and has been a lecturer in engineering at Cambridge University since 1952.

E.C.V.



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YOU CAN'T RISK costly shutdowns on full-scale production jobs – that's why Goodyear belts are the wisest choice for Multi-Vee drives. They can be fitted and forgotten – there's no better testimony to their trouble-free operation! There's a range of these 'job-designed' Goodyear V-Belts to give longer service and more efficient transmission on every type of drive. The Goodyear Technical Man will gladly advise on the right belt for any job.

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Raw Material Markets

Iron and Steel

Continuous efforts are being made by the iron-foundries to secure more business, but demands for castings from many trades remain moderate and totally insufficient to keep all establishments fully engaged. Fortunately, the motor-car industry keeps up a steady and regular demand and it provides the engineering and speciality foundries catering with sufficient work to enable them to obtain reasonably good outputs. The overall consumption of high-quality castings continues at a much better rate than for other grades, so that the foundries supplying these are in a much better position than the foundries producing castings for the light industries and the jobbing and textile foundries. The light foundries connected with the domestic utensil trades continue to report improvement in the call for castings, and many of them now have much larger order-books than they have had for a long time past. But there is still plenty of room for further improvement.

The extent of the demand for castings is reflected in the call for the different grades of pig-iron. The low-phosphorus irons used for the production of high-duty castings are in much greater call than the other grades, but the foundries are able to obtain all the supplies they need without difficulty. They are also consuming fairly good quantities of hematite and some refined irons. In all these grades consumption is below overall outputs and most producers have fairly good stocks on hand. High-phosphorus pig-iron is plentiful, and the foundries using this grade, including the light, jobbing, textile, and some of the engineering foundries, have insufficient work on hand to enable them to absorb anywhere near the tonnages available. Some of the light foundries are better off for work than they were, but with the larger consumption of scrap in their mixtures the improvement has not resulted in increased demands for pig-iron to the extent expected.

There continues to be a good demand for the better and heavier grades of cast-iron scrap. Foundry coke deliveries are satisfactory, and ganister, limestone, and firebricks are in good supply.

There is little change in the trading position at the re-rollers, and most of the mills are badly in need of more work. Orders arising for their products are moderate, and only permit them to work on a reduced number of shifts. Re-rollers of small bars and light sections are very short of work and the small tonnages called for necessitate frequent roll changing at increased production costs.

Demands for steel semis show little improvement, and what tonnages are being specified are for immediate consumption, as stocks at the re-rollers are kept at a minimum level.

Non-ferrous Metals

The copper price in London continues to fluctuate in accordance with the position and prospects for the red metal on the other side of the Atlantic. That being so, the London price has moved around £247 to £250 a ton, the upper and lower levels being largely determined by the overnight strength or weakness of the New York Commodity Exchange. Rumours, too, have helped. Indeed, threatened strikes in Chile, a railway situation in Montana, and confused reports as to whether or not labour had walked out at Kennecott's Chino mines contributed to the steadiness or otherwise of the undertone last week.

These factors appear to have put the London copper price beyond the dicatates of supply and demand considerations, and so long as the New York market remains basically strong and the London market basically weak, this situation will continue. In the US demand for copper is good and the outlook, according to the Department of Commerce, is favourable. This opinion from the US Government is based on the view that, with increasing construction projects, rising automobile production, and the fact the consumers were looking to their inventories, demand for copper during the first half of 1959 would be favourable. This forecast was made by the Department's Business and Defence Services Administration in its quarterly report, which included the qualification that inventories were probably being replenished as a possible hedge against a work stoppage when union contracts expired on June 30 next.

Meanwhile, US custom smelters are quoting 34 cents and producers 31½ cents a pound. In London the undertone is only fairly steady and demand is far from sufficient to maintain the present price levels. The stock position, *vis-à-vis* the present prices, is becoming a little intolerable and at the present rate of build-up, copper stocks will soon be greater than those of tin. The stock position eased last week somewhat unexpectedly when copper stocks fell 225 tons to 9,641 tons.

Tin has made a good comeback. The new quota period has seen heavy trading activity in the East and with buying in London concentrating on cash supplies the spot quotation has again gone over the £780 a ton level. The tin price has been mainly above the buffer stock minimum, but it is doubtful whether the buffer stock manager has been active in the market to any extent. The present position is that London is steady, the East is steady-to-strong and the US is a satisfactory market, with the price holding around $1.03 a pound. Tin stocks in London after last week's fall of 570 tons fell to 10,179 tons.

Lead in the US, after being out of line with the price of the metal in other market centres for several weeks, was finally lowered by ½ cent to 11 cents a pound. This is still equivalent to £88 a ton and compares with the LME price of around £69 a ton. Lead has been a poor market in London for a long time and recently it has been hard hit by heavy sales and the fear of further restrictions on imports into the United States.

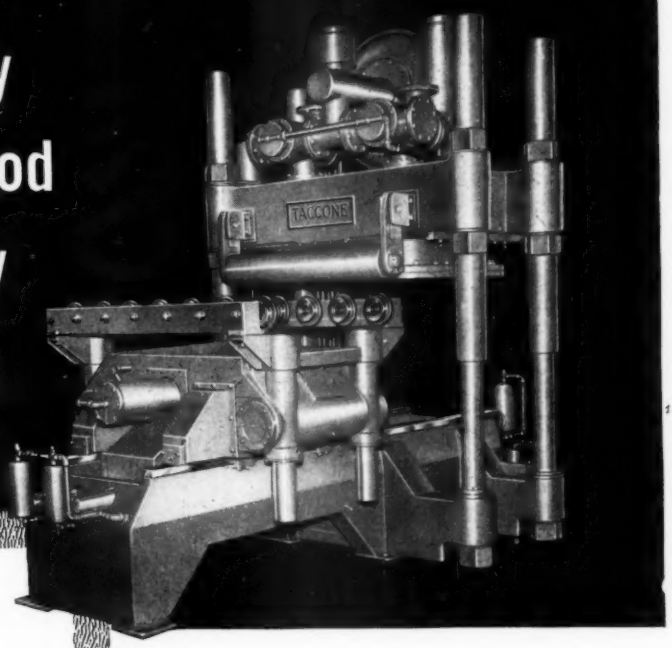
Zinc, too, is suffering from fears of further restrictions on imports into the US and the London price is not far above £70 a ton. The best description of the London market is, perhaps, to describe it as "nervous." The US price remains at 11 cents a pound.

IBF Scottish Branch

In the report of the annual dinner of the Scottish branch of the Institute of British Foundrymen, published in the "Notes from the Branches" feature in the March 26 issue of the JOURNAL, Bailie James Bias was quoted as saying that a civic reception might be arranged for the forthcoming National Works Visits Day. The secretary of the branch has pointed out that this statement is incorrect and that in fact Bailie James Bias merely intimated that a civic reception might be arranged for the spring of 1960 in recognition of the 50th anniversary of the foundation of the branch.

THE IRON AND STEEL INSTITUTE is holding its ninetieth annual general meeting at Church House, Great Smith Street, London, S.W.1, on May 6 and 7. A members' dinner has been arranged for May 6, and this will be held at Grosvenor House, Park Lane, London, W.1, at 7 for 7.30 p.m. (Tickets £2 10s. 0d. each, exclusive of wine.)

An entirely NEW method of Foundry Moulding



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'TACCONE' HIGH PRESSURE DIAPHRAGM MOULDING MACHINE

The 'Taccone' machine makes precision green sand pressure moulding available to every foundry. It ensures sound, accurate castings and the moulds it produces are superior to those made by conventional equipment. 'Taccone' moulds are consistently hard and uniform throughout and can be effortlessly produced by unskilled labour

All types of pattern equipment, including plaster wooden, plastic and metal patterns can be used, and there is practically no limitation on the size of flask employed. 'Taccone' machines are handling flasks 8ft. by 8ft. (larger sizes are envisaged) and already over 200 'Taccone' installations are in operation.

The dimensional accuracy and finish on the castings is comparable with work produced by shell moulding techniques.

The 'Taccone' is more than a machine, more than a process—it is a revolutionary system for rapid mould production.

Ten standard machines are available in the manufacturing range and special machines can be built to any size for any purpose.

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Telephone: JARROW 897124 BP/F1

Current Prices of Iron, Steel, and Non-ferrous Metals

(Delivered unless otherwise stated)

April 8, 1959

PIG-IRON

Foundry Iron.—No. 3 IRON, CLASS 2: Middlesbrough, £21 6s. 0d.; Birmingham, £20 18s. 3d.

Low-phosphorus Iron.—Over 0.10 to 0.75 per cent. P, £23 17s. 0d., delivered Birmingham. Staffordshire blast-furnace low-phosphorus foundry iron (0.10 to 0.50 per cent. P, up to 3 per cent. Si), d/d within 60 miles of Stafford, £24 1s. 3d.

Scotch Iron.—No. 3 foundry, £25 3s. 6d., d/d Grangemouth.

Cylinder and Refined Irons.—North Zone, £25 19s. 0d.; South Zone, £26 1s. 6d.

Refined Malleable.—P, 0.10 per cent. max.: North Zone, £27 6s. 6d.; South Zone, £27 9s. 0d.

Hematite.—Si up to 2 per cent., S. & P. over 0.03 to 0.05 per cent.: N.-E. of England (local iron), £25 6s. 6d.; Scotland (Scotch iron), Zone S.1, £25 13s. 0d.; Sheffield, £26 15s. 0d.; Birmingham, £27 4s. 0d.; Wales (Welsh iron), £25 6s. 6d.

Basic Pig-iron.—£20 3s. 0d., delivered Staffs, Derbyshire, Notts, Lincs, Rutland, Northants, and Leics.

FERRO-ALLOYS

(Per ton unless otherwise stated, delivered)

Ferro-silicon (6-ton lots and over).—45 per cent. Si, £41 0s. 0d. to £43 10s. 0d., scale 15s. 0d. per unit; 75 per cent. Si, £56 10s. 0d. to £60 10s. 0d., scale 15s. 0d. to 16s. 0d. per unit.

Ferro-vanadium.—50/60 per cent., 22s. 6d. per lb. of V.

Ferro-molybdenum.—65/70 per cent., carbon-free, 12s. 10d. per lb. of Mo.

Ferro-titanium.—20/25 per cent., 2-3 per cent. Cu, £250 0s. 0d.; 38/40 per cent., commercially carbon-free, £287 0s. 0d.

Ferro-tungsten.—80/85 per cent., 7s. 11d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 10s. 11d. per lb. of W.

Ferro-chrome (6-ton lots and over).—4/6 per cent. C, £77 0s. 0d. to £81 0s. 0d., basis 60 per cent. Cr, scale 26s. 0d. to 27s. 6d. per unit; over 6 per cent. C, £74 10s. 0d. to £77 10s. 0d., basis 60 per cent. Cr, scale 26s. 0d. to 27s. 6d. per unit; 2 per cent. C,* 1s. 7½d. to 1s. 10½d. per lb. Cr; 1 per cent. C,* 1s. 8d. to 1s. 11d. per lb. Cr; 0.15 per cent. C,* 1s. 9d. to 2s. 0d. per lb. Cr; 0.10 per cent. C,* 1s. 9½d. to 2s. 0½d. per lb. Cr; 0.06 per cent. C,* 1s. 9¾d. to 2s. 0¼d. per lb. Cr.

Metallic Chromium.—98/99 per cent., 6s. 10d. per lb.

Metallic Manganese.—94/96 per cent., carbon-free, £245 0s. 0d.; 96/98 per cent., £275 0s. 0d.

Ferro-columbium.—65/72 per cent., Cb + Ta, 19s. 9d. per lb., Cb + Ta.

Ferro-manganese (home).—78 per cent., £69 10s. 0d.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—BASIC: Soft u.t., £32 15s. 6d.; tested, 0.08 to 0.33 per cent. C, £33 15s. 6d.; hard (0.41 to 0.60 per cent. C), £34 17s. 0d.; silico-manganese, £43 16s. 6d.; free-cutting, £36 14s. 6d. SIEMENS MARTIN ACID: Up to 0.25 per cent. C, £41 1s. 0d.; silico-manganese, £44 4s. 0d.

* Average 68-70 per cent.

Billets, Blooms, and Slabs for Forging and Stamping.—Basic, soft up to 0.33 per cent. C, £38 10s. 0d.; basic hard, over 0.41 up to 0.60 per cent. C, £39 12s. 6d.; acid up to 0.25 per cent. C, £43 4s. 0d.

FINISHED STEEL

Heavy Plates and Sections.—Ship plates (N.-E. Coast), £42 2s. 0d.; boiler plates (N.-E. Coast), £44 12s. 0d.; floor plates (N.-E. Coast), £43 11s. 0d.; angles (N.-E. Coast), £39 16s. 6d.; joists (N.-E. Coast), £39 12s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., and flats 5 in. wide and under, untested soft basic, 50 tons and over, £40 0s. 6d.; under 10 tons to 4 tons, £40 18s. 0d.; under 4 tons to 2 tons, £41 3s. 0d.; hoop and strip, coils, £39 0s. 0d.; uncoated strip mill coils, hot rolled, under 3mm. to 12g., £44 16s. 0d.; black sheets (hand mill), 24g., £58 14s. 6d.; galvanized corrugated sheets, 24g., £67 10s. 0d.

Alloy Steel Bars.—1 in. dia. and up: Nickel, £68 10s. 0d.; nickel-chrome, £99 11s. 0d.; nickel-chrome-molybdenum, £111 19s. 0d.

NON-FERROUS METALS

Copper.—Cash, £247 10s. 0d. to £248 0s. 0d.; three months, £247 10s. 0d. to £248 0s. 0d.; settlement, £248 0s. 0d.

Copper Tubes, etc.—Solid-drawn tubes, 2s. 4½d. per lb.; rods, 266s. 0d. per cwt. basis; 20 s.w.g., 301s. 0d. per cwt.

Tin.—Cash, £782 10s. 0d. to £783 0s. 0d.; three months, £785 0s. 0d. to £785 10s. 0d.; settlement, £783 0s. 0d.

Lead (Refined Pig).—First half April, £69 5s. 0d. to £69 10s. 0d.; first half July, £70 2s. 6d. to £70 15s. 0d.

Zinc.—First half April, £71 17s. 6d. to £72 0s. 0d.; first half July, £71 15s. 0d. to £71 17s. 6d.

Zinc Sheets, etc.—Sheets, 15g. and thicker, all English destinations, £107 12s. 6d.; rolled zinc (boiler plates), all English destinations, £104 17s. 6d.; zinc oxide (Red Seal), d/d buyers' premises, £94 0s. 0d.

Brass Tubes, etc.—Solid-drawn tubes, 1s. 11½d. per lb.; sheets to 10 w.g., 205s. 3d. per cwt.; wire, 2s. 8¾d.; rolled metal, 205s. 3d. per cwt.

Brass (Brazing).—BS1400, B3 (65/35), £162; B6 (85/15), £203.

Brass (High Tensile).—BS1400, HTB1 (30 tons), £200; HTB2 (38 tons), £209; HTB3 (48 tons), — .

Gunmetal.—BS1400, LG2 (85/5/5/5), £202; LG3 (86/7/5/2), £211; G1 (88/10/2/½), £268; (88/10/2/1), £253.

Phosphor Bronze.—BS1400, PB1 (AID released), £295 per ton.

Leaded Phosphor Bronze.—BS1400, LPB1 (1060), £222 per ton.

Phosphor Bronze Strip, etc.—Strip, 303s. 6d. per cwt.; wire, 4s. 2¾d. per lb.; rods, 3s. 5½d.; tubes, 3s. 5½d.; chill cast bars: solids 3s. 5d.; cored 3s. 6d. (CHARLES CLIFFORD, LIMITED.)

Nickel Silver, etc.—Rolled metal, 3 in. to 9 in. wide × 0.056, 3s. 10½d. per lb.; round wire, 10g. in coils (10 per cent.), 4s. 3½d.; special quality turning rod, 10 per cent., ½ in. dia., in straight lengths, 4s. 2½d. All prices are net.

Other Metals.—Magnesium, ingots, 2s. 3d. per lb. Antimony, English, 99 per cent., £190 0s. 0d. Quicksilver, ex-warehouse, £78 0s. 0d. Nickel, £600 0s. 0d. Aluminium ingots, £180 0s. 0d.; aluminium bronze (BS1400), AB1, £235; AB2, £250.

Nuclear Power-station for Japan

Japan's first nuclear power-station is to be British. Its total cost will be about £30,000,000 of which some £20,000,000 will be spent in Britain. Dr. T. Ipponmatsu, vice-president of the Japan Atomic Power Generation Company, who arrived in London with a team of experts for final technical discussions with the General Electric Company, Limited, the main contractors for the station and the UK Atomic Energy Authority, said that a satisfactory report was sent to Japan on March 27.

This proposed the immediate dispatch of a "letter of intent" to the GEC—Simon-Carves Atomic Energy Group, but the legal formality of a contractual agreement is not expected until June.

The contract is the first to be won by Britain in the Far East in the face of intense US competition, but it is understood that Japan's next foreign reactor will be obtained from the United States.

An official of the British company said that first a team of engineers would be sent out to arrange for the local staffing of the project. As main contractors GEC would supervise all work on the site. Manufacture of the associated electrical transmission equipment including transformers and switchgear would be undertaken by Japanese firms, but the major installations, such as the nuclear reactor, generating sets, and some of the ancillary machinery, would be supplied by Britain.

LEYLAND MOTORS, LIMITED, Lancs, have received an order from Oy Suomen Autoteollisuus A.B., of Helsinki, for 1,000 diesel engines. The first consignments of the engines are now being shipped to Finland for use in Finnish-built trucks and buses.

British Aluminium Board

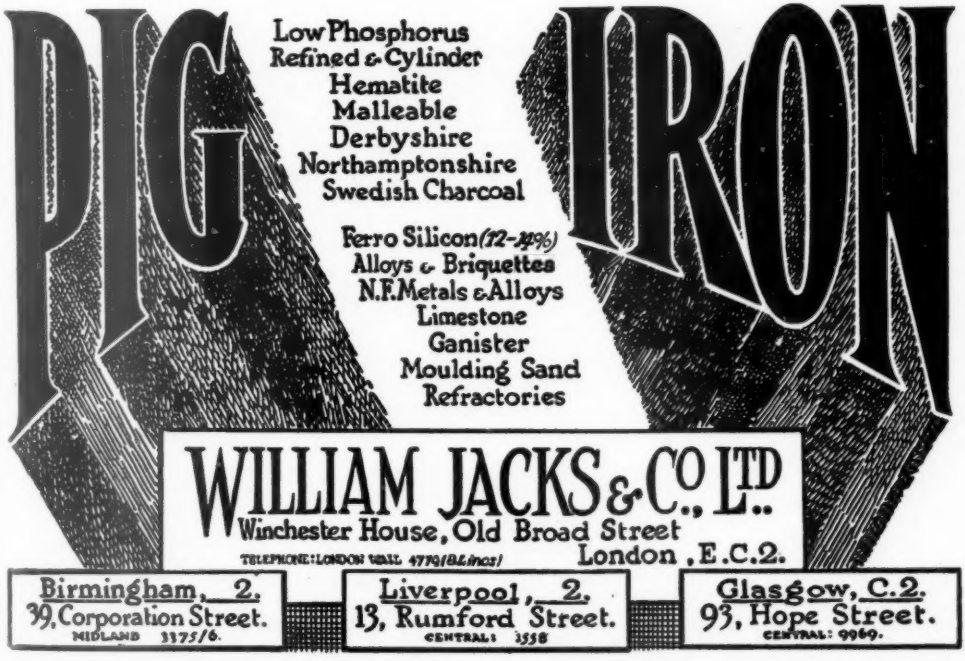
Two more directors for the British Aluminium Company, Limited, control of which was recently acquired by Tube Investments, Limited, have been announced. They are Major-General Sir Francis de Guingand and Mr. J. L. Reynolds. Sir Francis, who was Chief of Staff to Field Marshal Viscount Montgomery in the last war, joined the board of TI last month, but since 1949 he was in charge of TI's interests in South Africa.

Tube Investments' partner in British Aluminium is Reynolds Metals of the US, the chairman of which, Mr. Richard S. Reynolds, is already on the British Aluminium board.

Compensation for loss of office of £30,000 to Lord Portal of Hungerford and £58,000 to Mr. Geoffrey Cunliffe, former chairman and managing director, respectively, of British Aluminium, was approved at an extra-ordinary meeting of the company last week. The chairman, Sir Ivan Stedeford, said he had received 7,856,817 proxy votes in favour and 17,635 against the resolution.

The meeting also approved resolutions increasing the number of directors from 12 to 16, the appointment of alternative directors, and removing the requirement for directors to hold qualification shares.

CROFTS (ENGINEERS), LIMITED, of Thornbury, Bradford 3, Yorkshire, has issued an excellent map of Lancashire and Yorkshire which shows, by small pictures, all the castles, cathedrals, and the like, in these counties, one exception, however, is Selby Abbey, a magnificent example of ecclesiastical architecture. Still, full marks are accorded for a most interesting map.



CLASSIFIED ADVERTISEMENTS

PREPAID RATES: Fifteen words for 7/6 (minimum charge) and 4d. per word thereafter. Box Numbers 2/6 extra (including postage of replies). Situations wanted 2d. per word throughout.

Advertisements (accompanied by a remittance) and replies to Box Numbers should be addressed to the Advertisement Manager, Foundry Trade Journal, John Adam House 17/19, John Adam Street, Adelphi, London, W.C.2. If received by first post Monday advertisements can normally be accommodated in the following Thursday's issue.

SITUATIONS WANTED

PATTERNMAKER (36), machine, floor, shell moulding, core blowing and estimating experience, seeks post with prospects of advancement.—Box PM603, FOUNDRY TRADE JOURNAL.

YOUNG FOUNDRY TECHNOLOGIST, Diploma of the National Foundry College, experience in High Duty Irons, jobbing and production up to 3 tons, also non-ferrous, estimating and planning experience, seeks opening with progressive company, ferrous or non-ferrous. Prepared to travel abroad.—Box YF600, FOUNDRY TRADE JOURNAL.

FOUNDRY CONSULTANT with wide experience gained on the Continent and England, offers to introduce a special gravity die casting process designed to improve the appearance and physical properties.—Box FC601, FOUNDRY TRADE JOURNAL.

TECHNICAL REPRESENTATIVE, Midlands, practical foundry man, excellent technician, open engagement. Car, 'phone, etc. Thorough knowledge of, and many contacts Midland foundries. Salary, commission, expenses basis.—Box TR567, FOUNDRY TRADE JOURNAL.

ADVERTISER with expert knowledge Brass Gravity Die Casting (Kollengers) Process (German), desires contact firms interested.—Box AW568, FOUNDRY TRADE JOURNAL.

FOUNDRYMAN (FOREMAN PATTERNMAKER). Age 37 years, seeks position in Essex or Southern Counties. Experience in foundry trade of a wide and varied nature covering castings of intricate design and up to a weight of ten ton. At present in executive position in motor industry. South Wales. Good references available. Box FF605, FOUNDRY TRADE JOURNAL.

STEEL FOUNDRY REPRESENTATIVE, resident Birmingham, experienced carbon and alloy steel castings, extensive connection in Midlands & Southern half England, desires change, offer invited from reputable foundry company. Box SF533, FOUNDRY TRADE JOURNAL.

FOUNDRY METALLURGIST/TECHNOLOGIST, at present studying in the Final Year of the National Foundry College Diploma Course. Seeks an opening in SALES or DEVELOPMENT, with a well established firm dealing with foundry supplies and/or equipment. Position must offer challenge. Prepared to travel abroad if necessary. Box FM548, FOUNDRY TRADE JOURNAL.

FOUNDRY METALLURGIST / TECHNOLOGIST, 30, experienced in grey and high duty iron castings production, foundry methods, cupola, sand control, seeks progressive responsible position.—Box FM565, FOUNDRY TRADE JOURNAL.

SITUATIONS WANTED—*contd.*

TECHNICAL REPRESENTATIVE, age 33, A.M.I.B.F., wishes to offer top representation in the southern counties; will promote good relationship and sales. Good foundry technician of proven ability, five years' drawing office experience, non-ferrous dies, lost wax, shell moulding and mechanised methods of the motor industry. Box TR562, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT

EXPERIENCED SALES REPRESENTATIVE for London and Home Counties required by well established London Iron Foundry. Write, giving details of experience, age and salary required, to Box ES555, FOUNDRY TRADE JOURNAL.

PLASTER-CASTING TECHNICIAN able to produce pressure cast aluminium match plates from master patterns required by South African foundry producing variety of small castings. Must be first class man fully conversant with procedure. Write for details to FOUNDRY MANAGER, P.O. Box 202, BOKSBURG, Transvaal, South Africa.

SOUTH AUSTRALIA
FOUNDRY SUPPLIES

LARGE Wholesale Merchants in Adelaide have vacancy in their FOUNDRY SUPPLIES DEPARTMENT for a man with good merchanting experience, i.e., purchasing and selling (wholesale) of Foundry Fluxes, Founders' Metals, Crucibles, Assayers' Materials, etc. Foundry experience by itself is not sufficient.

Nominated passages for applicant and family, accommodation provided initially, pension scheme, etc. Apply in writing, giving age, marital status, and details of training and experience and with copies of testimonials, if any, to the agents, DAVIS & SOPER, LTD., 52 & 54, St. Mary Axe, London, E.C.3.

FOUNDRY FOREMAN required for semi-mechanised non-ferrous foundry in Birmingham. A permanent and progressive appointment offering good salary and pension to a capable man with technical and administrative ability. An additional knowledge of the gravity die-casting process would be helpful.—Replies in strict confidence to Box FF571, FOUNDRY TRADE JOURNAL.

TECHNICAL SALES REPRESENTATIVE required to cover the Lancashire Area for the marketing of floor moulded castings in grey and alloyed irons and steels, together with a variety of small repetitive castings. The applicant must have previous experience and established connections in this field. Progressive superannuated post, with attractive salary and car provided.—Apply in confidence, giving full details and quoting reference F.D. to PERSONNEL MANAGER, SHEEPBRIDGE ENGINEERING, LTD., Chesterfield.

SITUATIONS VACANT—*contd.*

SALES ENGINEER required by Abrasive Wheel Manufacturer of international repute in the Midland area. Knowledge of grinding operations in foundries, drop forge, welded steel fabrication and allied trades desirable. Aged 30-36. Excellent prospects. Pension and Bonus Schemes in operation. All replies will be treated in confidence.—Box SE566, FOUNDRY TRADE JOURNAL.

EXPERIENCED SALES REPRESENTATIVE, having a genuine, well established and really live connection with Engineering firms in London and Home Counties, required by reputable firm of Ironfounders. Knowledge of foundry practice an advantage, but first class personal connection main consideration.—Box ES570, FOUNDRY TRADE JOURNAL.

FOUNDRY FOREMAN required for Malleable Iron Foundry in Walsall district. Sound practical experience and ability to handle workmen essential. Good prospects for right man with drive and initiative. State age and salary required. —Box FF573, FOUNDRY TRADE JOURNAL.

FOREMAN required for aluminium pressure diecasting foundry in S. London. This is an excellent opportunity in expanding business for a man with the necessary experience and ability. Please write, stating age, details of experience and salary required.—Box FR602, FOUNDRY TRADE JOURNAL.

FOUNDRY MANAGER wanted for West Midland Ironfoundry. Experience of Shell Moulding an advantage. Write stating age, experience and salary required. Box FM607, FOUNDRY TRADE JOURNAL.

STEEL FOUNDRY METHODS ENGINEER required for fully mechanised foundry in South Yorkshire. Applications are invited from experienced men to fill a permanent staff position. Write stating age, experience and salary required to Box SF604, FOUNDRY TRADE JOURNAL.

FOUNDRY TECHNICIAN required for European Associate of British concern, with specialised knowledge in the production of Cylinder Blocks and Cylinder Heads. Must be capable of controlling all aspects of production from raw materials to finished castings. Interesting and remunerative salaried position for suitable applicant. Write stating experience to Box FT605, FOUNDRY TRADE JOURNAL.

VITREOUS ENAMEL. Two vacancies exist at a modern Frit Factory situated in Warrington for a FRIT DEVELOPMENT CHEMIST/TECHNICAL SERVICE OFFICER. Whilst experience in this industry is preferable applications are also invited from those experienced in allied branches of ceramics. Replies stating age and a brief review of positions held should be addressed to: RADIATION FRIT FACTORY, Grappenhall Works, Warrington, Lancs.